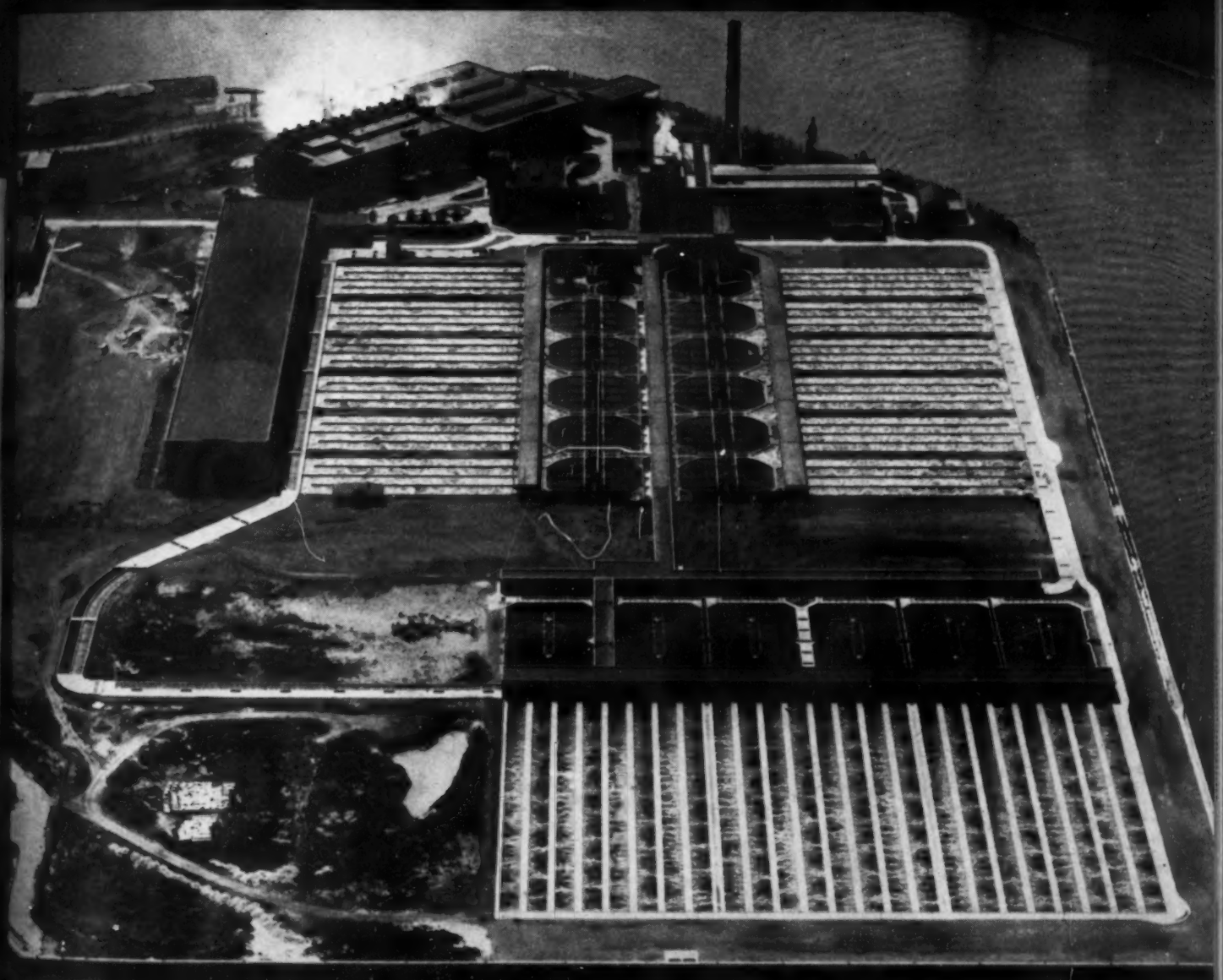
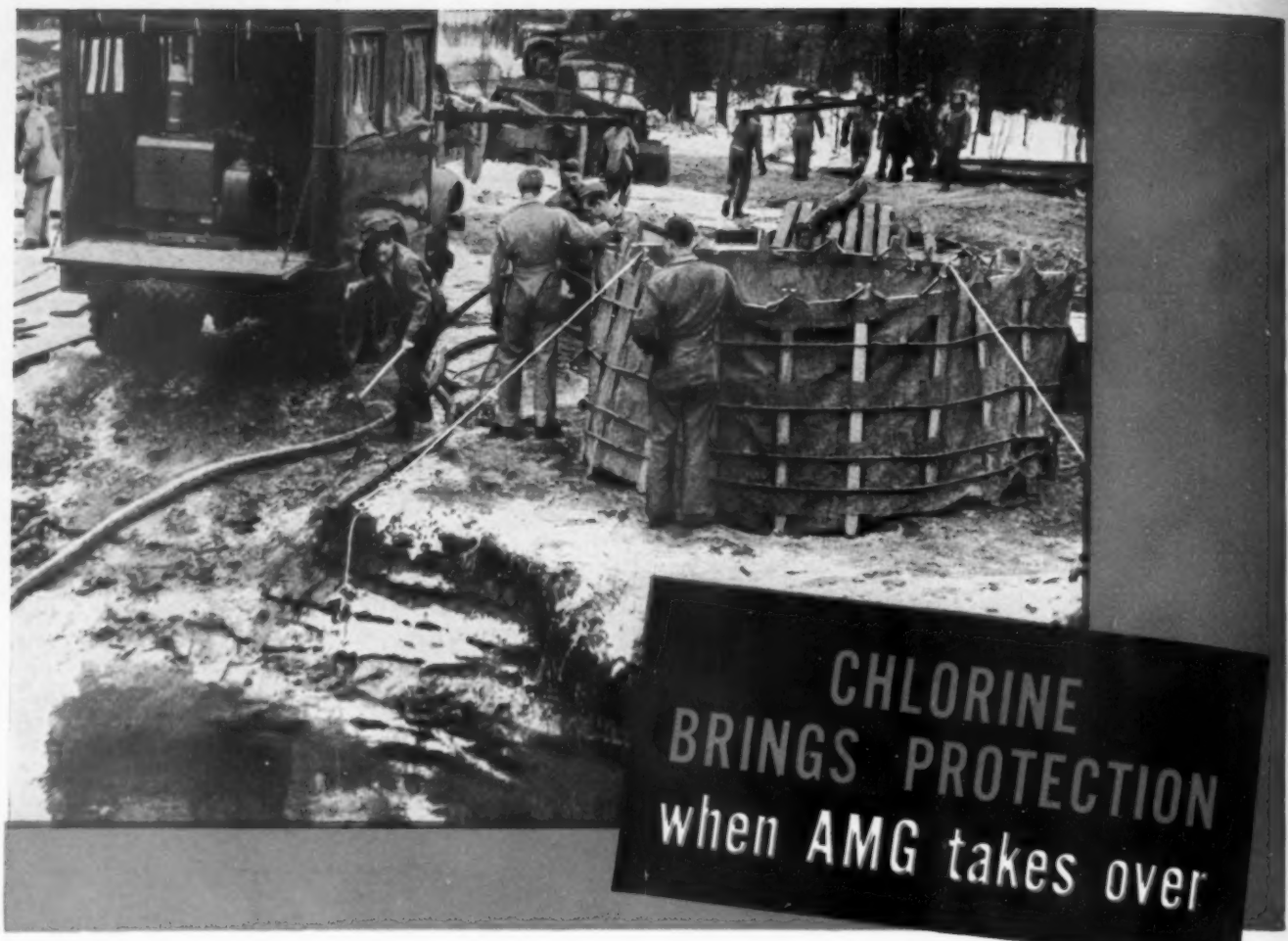
WATER WORKS & SEWERAGE



MILWAUKEE'S PIONEERING ACTIVATED SLUDGE AND FERTILIZER PRODUCTION PLANT



As combat troops advance beyond captured territory, specially trained officers and men move in and take over civilian administration. This is AMG . . . Allied Military Government of occupied territory . . . which includes in its multitude of duties the sanitation of potable water.

After the landings in Sicily and Italy, AMG took control of the water and with the aid of chlorine provided quick protection against water-borne disease.

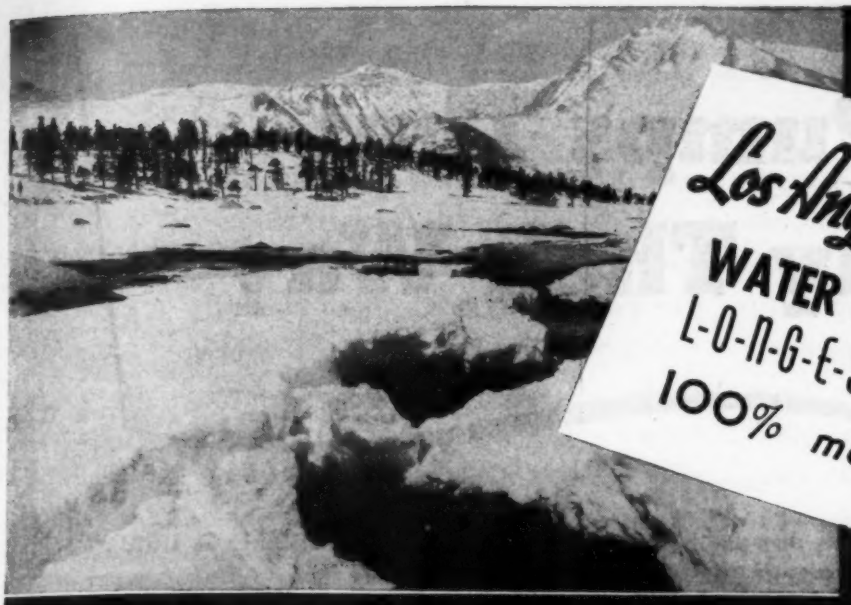
Chlorine and its compounds are playing many an important role in war sanitation . . . Not only are they used for purifying water at the front and in training camps—but they serve also as bactericides for the medical and dental corps—they are used in laundries for bleaching and disinfecting—in footbaths they protect against common fungus infections.

For these urgent and vital needs Penn Salt supplies much of its present expanded output of chlorine chemicals. That means, possibly, that we cannot fill your order for customary peacetime amounts. However, our wide wartime experience in this field and our increased facilities will be put wholeheartedly at your service as soon as Victory is won.

PENN SALT MANUFACTURES
Liquid Chlorine
for water sanitation and sewage treatment
ALSO
Perchloron* • Anhydrous Ammonia • Filter Alum
Ferric Chloride • Sodium Aluminate • Chloride of Lime
Caustic Soda and other products
*Trade-Mark Reg. U. S. Pat. Off.

PENNSYLVANIA SALT MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
New York • Chicago • St. Louis • Pittsburgh • Minneapolis • Wyandotte • Tacoma

WATER WORKS & SEWERAGE, March, 1944, Volume 91, Number 3. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.



FROM THE SNOWS OF THE HIGH SIERRAS

Los Angeles-Miracle City

WATER from the World's L-O-N-G-E-S-T Aqueduct is 100% metered!

BELIEVE IT OR NOT, the above snow scene was photographed in California. It was taken 350 miles from the miracle city, in the Sierra Nevada mountains, source of the City's principal water supply. Transmitted by means of cement-lined flumes and 9-foot steel pipe, the water flows through the World's longest aqueduct. It serves a population of close to two million people and is 100% measured through more than 300,000 meters. Yes, every drop of this mountain-fresh water is metered. More meters are in service in Los Angeles than any other city in the World.

THROUGH 350 MILES OF AQUEDUCT

BRINGING WATER TO LOS ANGELES

PITTSBURGH EQUITABLE METER COMPANY

ATLANTA BOSTON BROOKLYN BUFFALO CHICAGO COLUMBIA HOUSTON

MERCO NORDSTROM VALVE COMPANY
Main Offices, Pittsburgh, Pa.
NATIONAL METER DIVISION, Brooklyn, N. Y.

KANSAS CITY LOS ANGELES NEW YORK PITTSBURGH SAN FRANCISCO SEATTLE TULSA

Water Meters

Pumps That Pay Their Way

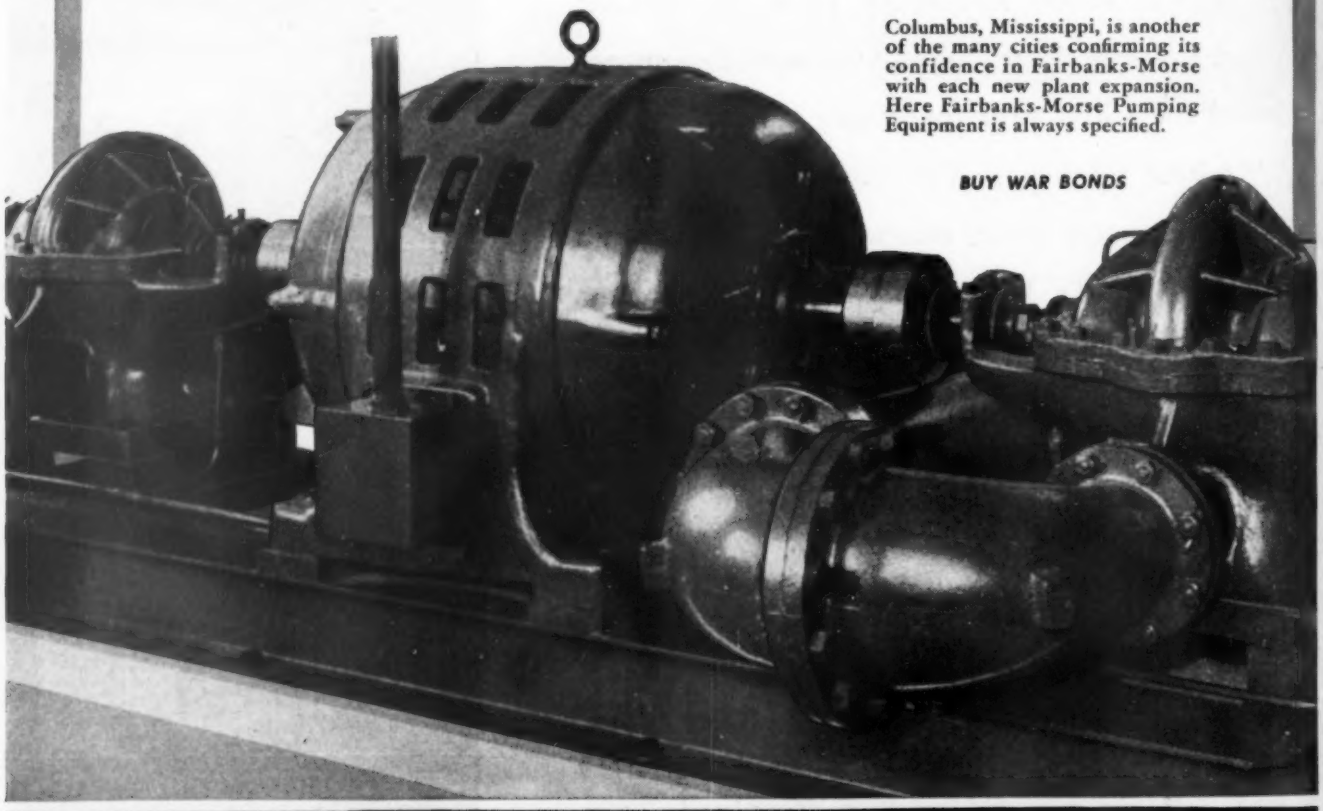
Fairbanks-Morse Pumps more than pay their way in water stations and sewage disposal plants.

They are a direct means of easing the burden of the taxpayer by the effective savings gained.

They enable you to retire your old pumps and save money. You can do this because Fairbanks-Morse Pumps are efficient . . . often paying for themselves in as little as a year.

Investigate now! Your pumps may be consuming up to 25% more power than necessary. A Fairbanks-Morse pump engineer can appraise their efficiency quickly and accurately. There is no obligation.

Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.



Columbus, Mississippi, is another of the many cities confirming its confidence in Fairbanks-Morse with each new plant expansion. Here Fairbanks-Morse Pumping Equipment is always specified.

BUY WAR BONDS

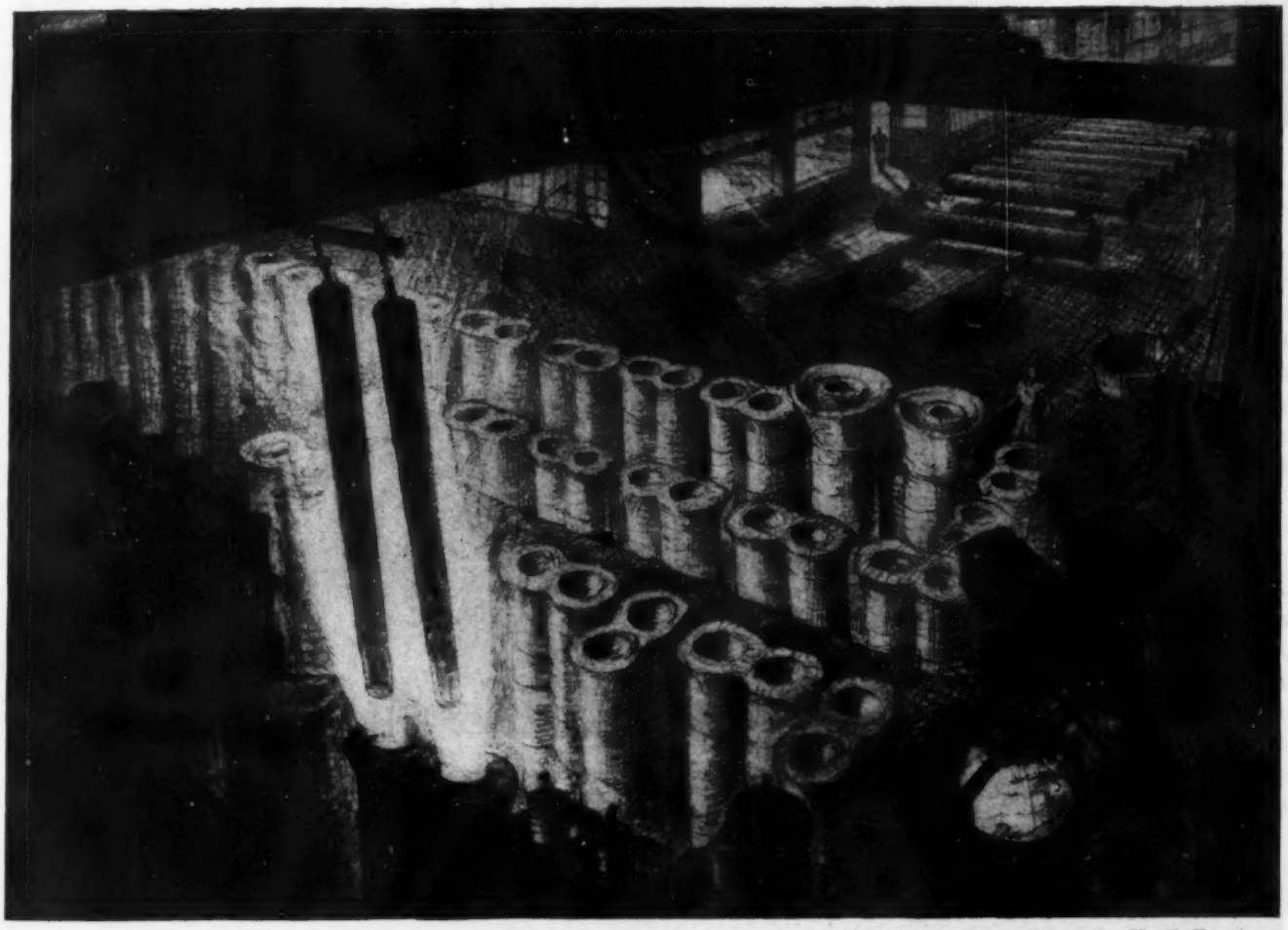
FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Pumps

Pipe a la carte

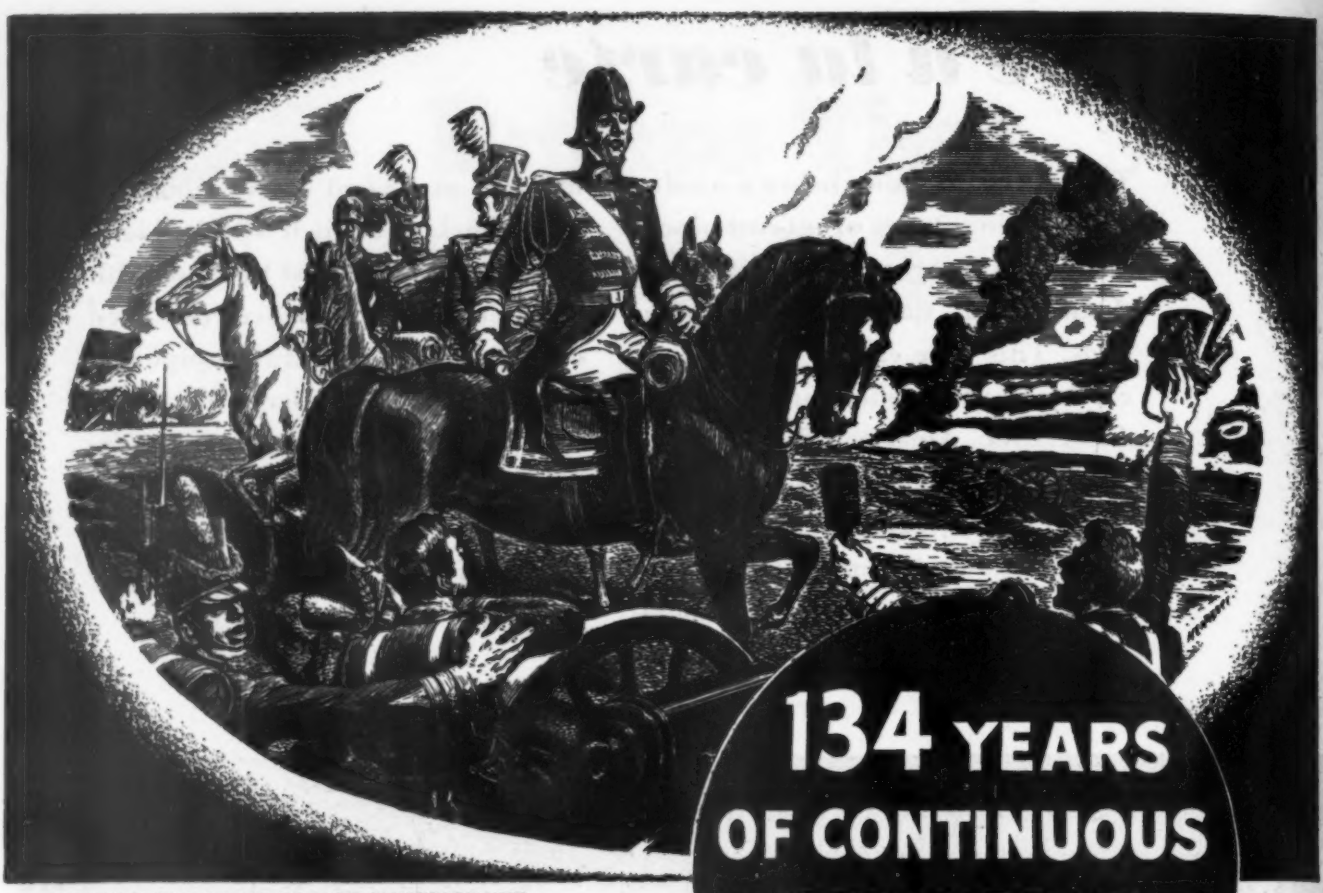
The casting pit shown below is used to make various types of pit-cast pipe—bell-and-spigot, mechanical joint, flexible joint, flanged, or with plain ends. This pipe can be made in accordance with American Standards Association, American Water Works Association, American Gas Association, Federal, or special engineers' specifications. Super-deLavaud centrifugally cast iron pipe is also manufactured at several of our plants in sizes 3-inch to 24-inch with bell-and-spigot and mechanical joints or with plain ends. But whatever your need or purpose, if it's cast iron pipe you want, we make it—large or small, lined or unlined, pit-cast or centrifugally cast. We have ample stocks of pipe and standard fittings for immediate shipment and can produce special requirements promptly.



Drawing core bars in one of our pit cast foundries, drawn by Hugh Ferriss

UNITED STATES PIPE & FOUNDRY CO.

General Offices: Burlington, New Jersey. ***Plants and Sales Offices throughout the U. S. A.***

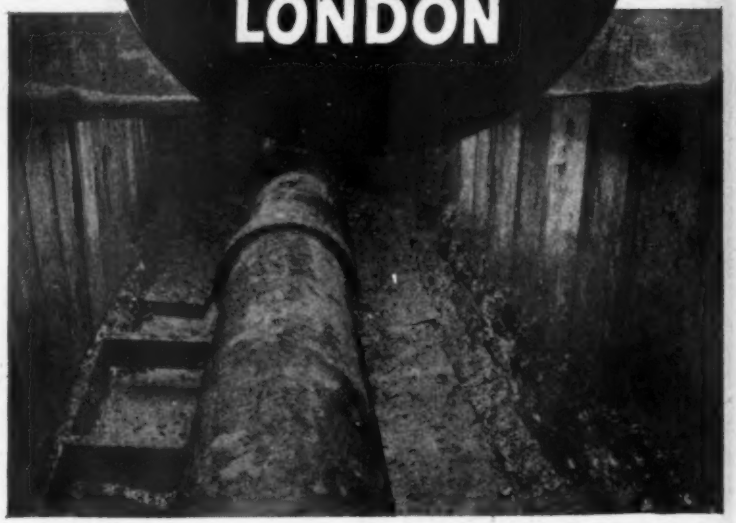


CAST IRON PIPE LAID IN LONDON BEFORE THE BATTLE OF WATERLOO IS STILL IN SERVICE.

134 YEARS OF CONTINUOUS SERVICE IN LONDON

BETWEEN 1810 and 1812—before Wellington defeated Napoleon at Waterloo—the cast iron water main, shown at right, was installed in London, England. It is still in service (unless recently bombed out). For when it was uncovered for inspection, and photographed, a few years ago, engineers pronounced it "as tight as when new." Before the war, 200-year-old cast iron water mains were known to be in service throughout Europe.

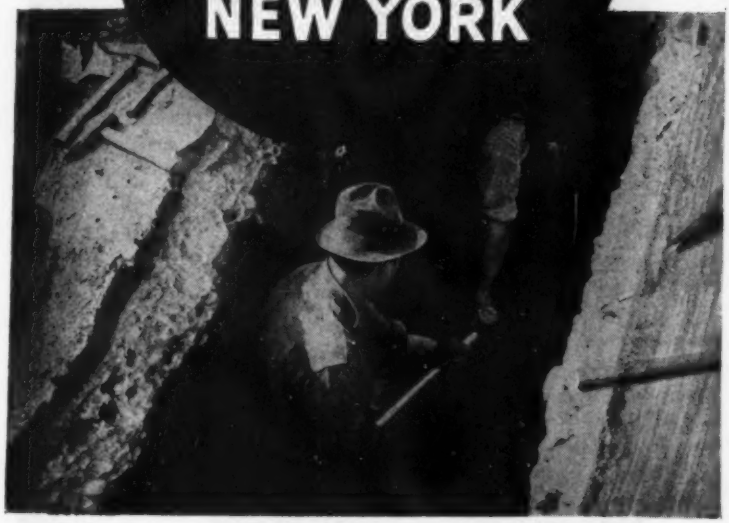
So when you specify cast iron pipe for current or postwar construction, you know one thing for certain—it will serve for centuries, in its original location or elsewhere. If the line has to be relocated or abandoned or replaced by larger diameters, you also know that cast iron pipe can be taken up and relaid, or salvaged for cash. You may also know that cast iron pipe costs far less to maintain than any other pipe used for water distribution mains, as proved by a survey conducted by a prominent engineering publication.



[Section of a cast iron water main laid in London between 1810 and 1812 and still functioning (at last report) after 134 years of continuous service.]

LINCOLN WAS ELECTED CAPTAIN BY HIS COMPANY IN THE BLACK HAWK WAR—113 YEARS AGO.

113 YEARS OF CONTINUOUS SERVICE IN NEW YORK



[Section of New York's oldest cast iron water main, installed 113 years ago in "Greenwich Village" and still in service.]

IN 1831, when Abraham Lincoln enlisted in the Black Hawk Indian War, the Common Council of the City of New York authorized the installation of a cast iron water main in what is now "Greenwich Village." It is still in service.

Today, more than a century later, the methods by which cast iron pipe is produced have undergone revolutionary changes. Metallurgical, laboratory and production controls have been developed. A recent and fundamental forward step is the new Law of Design for cast iron pipe in underground service, approved by the American Standards Association and sponsored by official organizations representing pipe users.

Thus, you can take it for granted that the cast iron pipe made today by our members, has not only *long life* as proved by generations of service the world over, but is more economical than ever.

CAST IRON

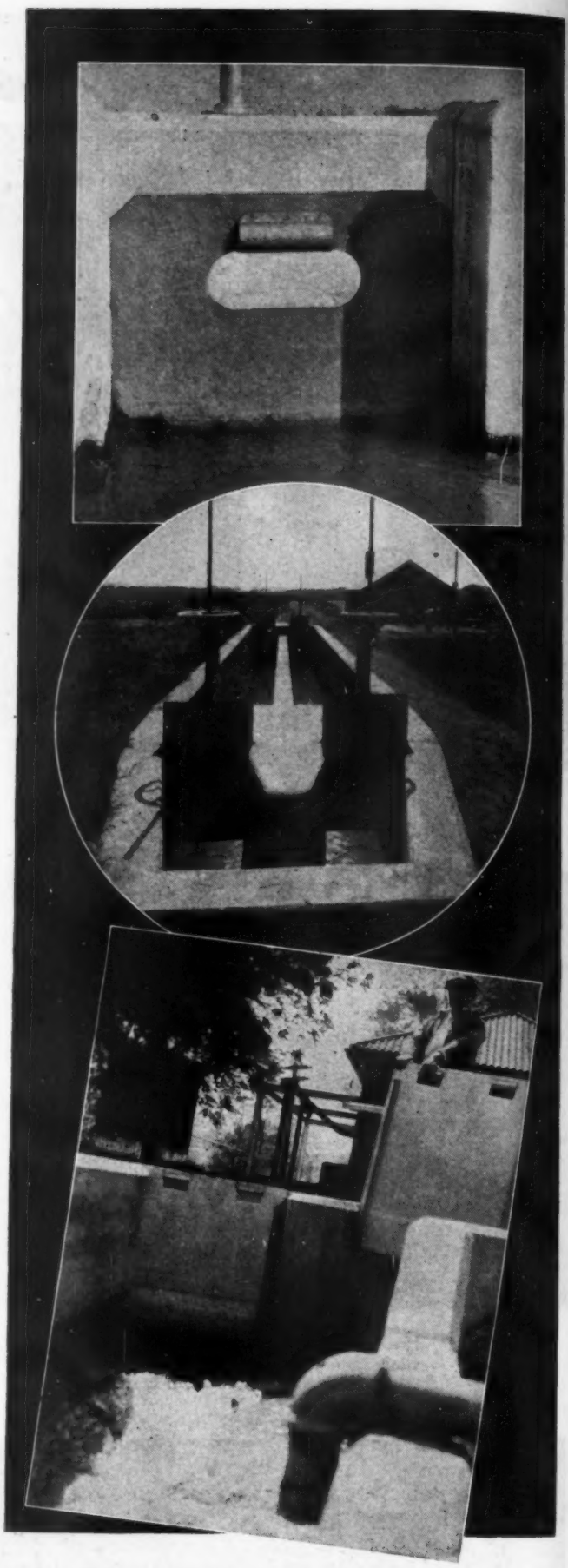
Cast Iron Pipe Research Association
Thomas F. Wolfe, Engineer, Peoples Gas Building, Chicago 3

Little things point the way to *Big Savings*

All through the war, and for years before the war, aluminum stop gates like these have been serving in sewage treatment plants all over the country. Nothing startling about that, except that the following facts about their performance point the way for designers of new plants: **1.** The lighter weight of aluminum gates has made work easier for operating men . . . **2.** There has been no rusting to destroy their usefulness or to cause gates to "freeze" in their guides . . . **3.** These Alcoa Aluminum gates are going right on working, good for many years of service.

Think of the many places in the jobs you now have on the drawing board where aluminum will serve you equally well. From skylights to sills, you can make construction better looking, longer lived, easier and cheaper to maintain, by specifying Alcoa Aluminum. In processing and handling equipment, ventilating ducts, conduit, instrument cases, and so on, you gain these same advantages.

Proof that it pays to build with aluminum is provided by its excellent performance in many treatment plants. Alcoa can give you data based on this experience to guide your design work. Write ALUMINUM COMPANY OF AMERICA, 1955 Gulf Building, Pittsburgh, Pa.



ALCOA ALCOA ALUMINUM **ALUMINUM**

AFTER VICTORY... A BRIGHT FUTURE FOR COMMUNITY LIFE

Soon there'll be busy days ahead on the American scene with plenty of new activity and big jobs to do. Rapidly growing population, ever-expanding industries will call for constantly increasing water supply.

These are the problems we should be concerned with today . . . for the days spent in planning now may save months of delay later on. In planning the water supply lines of tomorrow, it's the duty of every responsible official to build not only the sturdiest pressure lines possible, but also pipelines whose carrying capacity will be at a maximum and will remain undiminished so as adequately to meet the ever-increasing demands of the future.

Lock Joint Pipelines have served four decades of useful service, immune to tuberculation and corrosion, maintaining their original high capacity and original strength! The extensive use of these pipelines for important mains on various types of jobs throughout the country is abundant proof of their reliability and economy. Whether your project is large or small, for the present or the future, your 'phone call, telegram, cable or letter to any of our offices will bring an immediate response.

LOCK JOINT PIPE COMPANY

Established 1905

AMPERE, NEW JERSEY

Denver, Colo. · Chicago, Ill. · Kenilworth, N. J. · Kansas City, Mo. · Rock Island, Ill.
Joplin, Mo. · Valley Park, Mo. · Cleveland, Ohio · Hartford, Conn. · Navarre, Ohio

SCOPE OF SERVICES

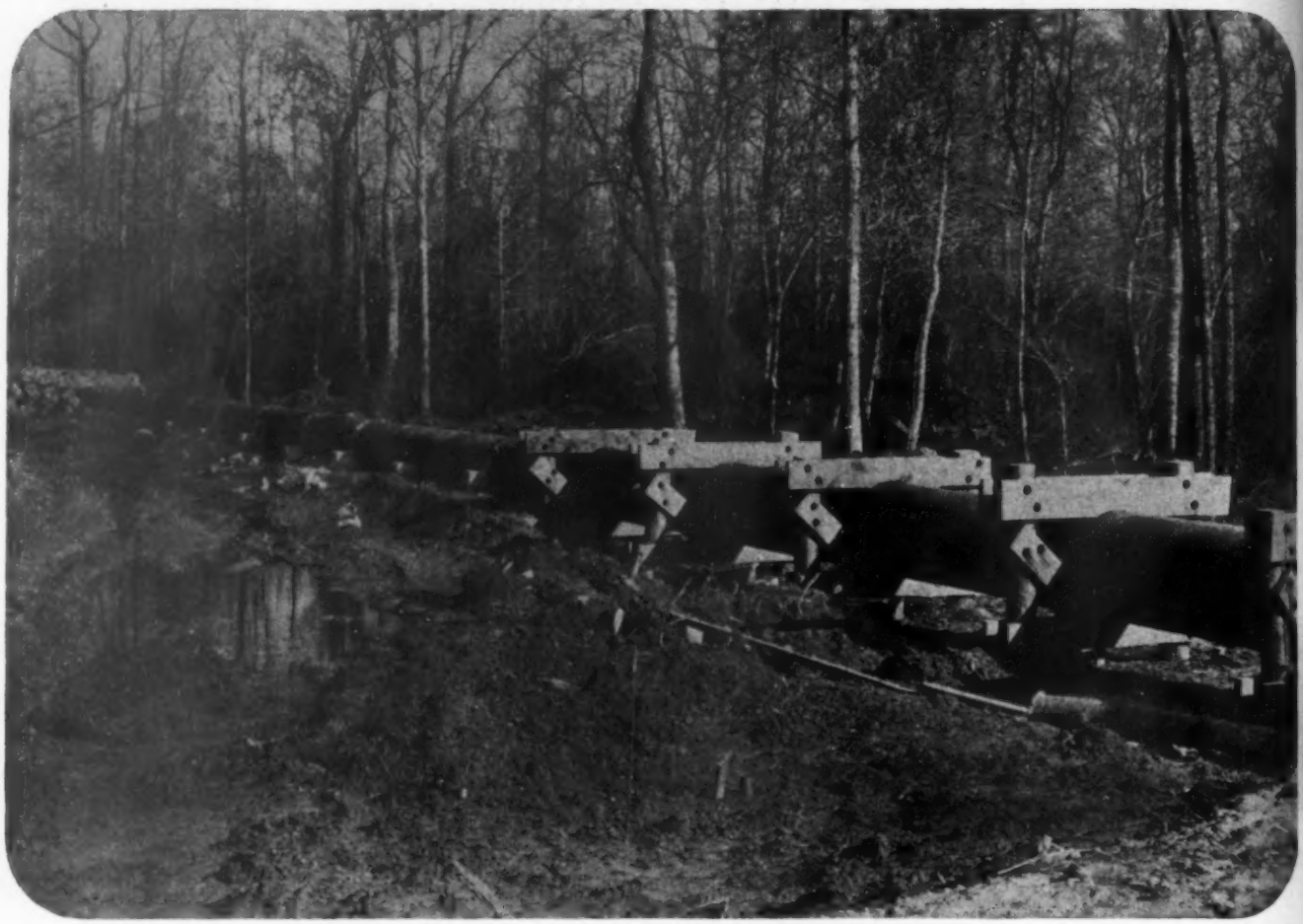
Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

★

Free Your Sewerage Systems

FROM THESE HAZARDS



Part of 18,000-ft. line of 36-in. ARMCO Paved Invert outfall sewer across swampy ground near Newport News, Virginia, carries treated sewage.

As you plan your sewerage projects for postwar construction, remember that by using Asbestos-Bonded ARMCO Sewer Pipe you can gain these four important advantages:

1. FREEDOM from disjointing and infiltration
2. FREEDOM from continual maintenance and early replacement
3. FREEDOM to use for both severe and normal conditions
4. FREEDOM to salvage and re-use elsewhere if conditions or requirements change

Those are the freedoms or assurances that Asbestos-Bonded ARMCO Sewer Pipe gives you. They come from flexibility—the ability to give slightly under load—light weight, bolted couplings, tightly-adhering bituminous coating over galvanizing, and a thick pavement to resist wear in the bottom. Write for the ARMCO Sewer Book. ARMCO Drainage Products Association, 195 Curtis St., Middletown, Ohio.

Buy More War Bonds

ASBESTOS-BONDED

Armco Sewer Pipe

Diamond Chlorine

at war

helps America's Victory Drive!

Chlorine Helps Make Bombers

In building a bomber, approximately one ton of Chlorine is used—in electric wire insulation, in plastics, for cooling motors, in cleaning metal parts during manufacture.

For Smoke Screens

Chlorine is used as an ingredient in the manufacture of smoke screen materials, widely used by ground and air forces as well as in naval warfare.

Defense Against Poison Gases

The best decontamination agents developed to date are Chlorine compounds. Uniforms and equipment are thus protected against war gas, and also decontaminated after exposure.

Dyes for Every Uniform

In the tremendous and exacting job of providing dyes for uniforms and clothing, as well as for other fabrics, Chlorine plays an important part.

Medical Supplies Use Chlorine

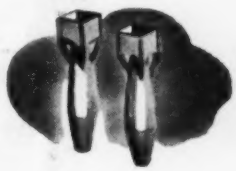
In the preparation of the life-saving Sulfa drugs, Chlorine is part of the product. Chlorine is used to manufacture bromine, used for medical purposes.

Field Water-purifying With Chlorine

In the field, portable chlorinators have proved of great value. In addition, our soldiers carry Chlorine tablets for purifying small quantities of water.

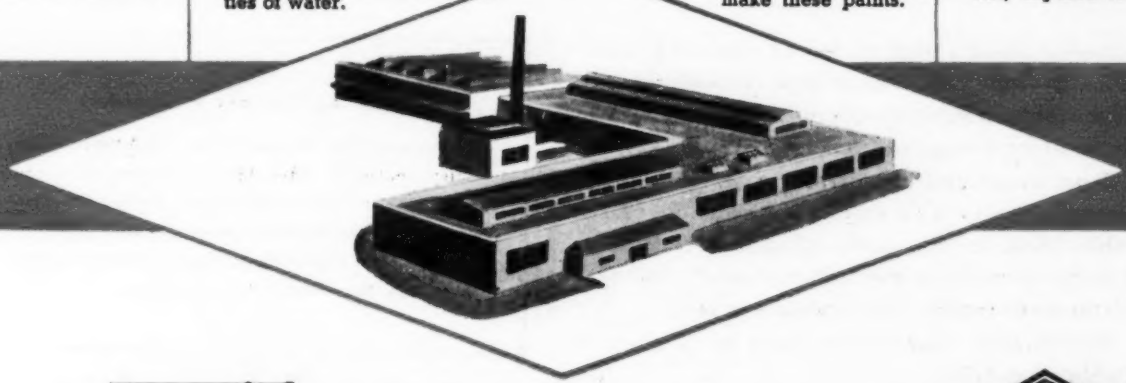
Flame-retarding Paint

An important and timely development has been flame-retarding paint and coatings for tents, tarpaulins, gun and truck covers, camouflage nets, etc. Chlorine helps make these paints.



Chemical Warfare

The versatility of Chlorine is demonstrated by the fact that it is required in all war gases—yet is the best agent for decontamination of materials, etc., exposed to these gases.



Essential for industrial mobilization, too

All along the industrial front, Diamond Chlorine serves in many vital roles. It helps bleach and refine the pulp needed for blueprint and other papers—and for explosives! In the manufacture of the plastics now used in place of more critical materials, Diamond Chlorine is used. It refines metals and alloys—helps keep power plants running by eliminating algae and impurities that reduce the efficiency of condensers and other units.

Never before have the dependable uniformity and purity

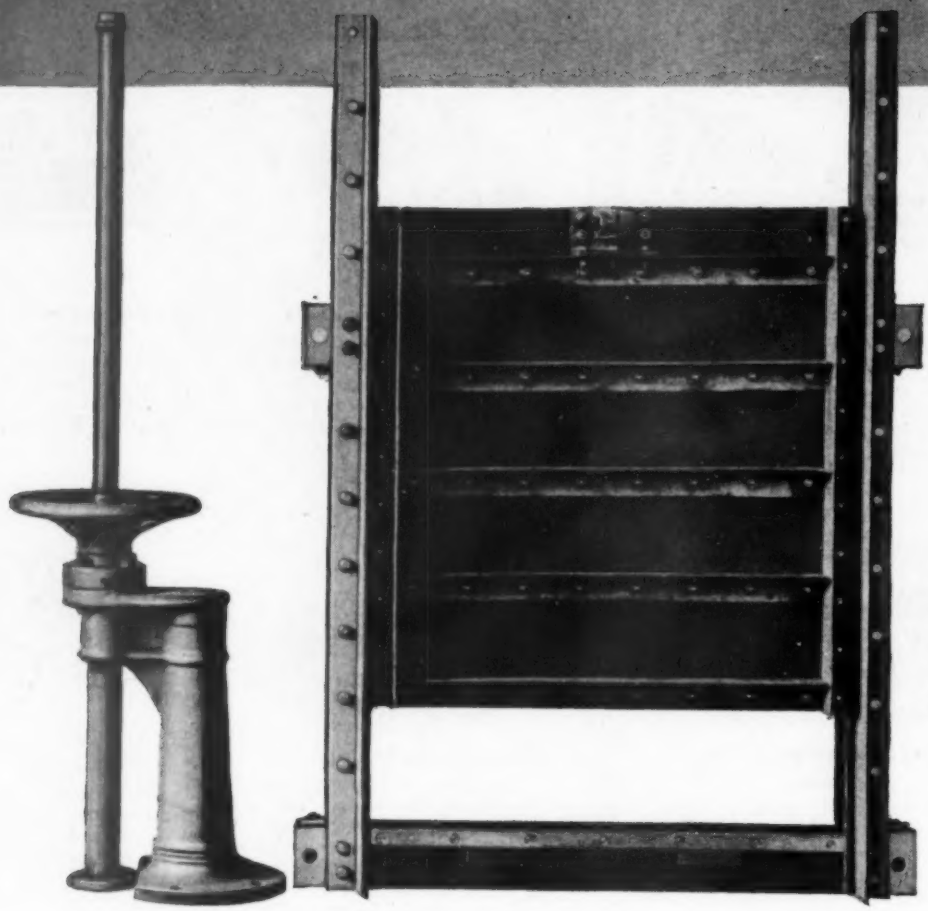
ALKALI

DIAMOND ALKALI COMPANY

PITTSBURGH, PA., *and Everywhere*

Trouble-free performance

PROVES EVERDUR OUTSTANDING IN SEWAGE SERVICE



Everdur Sluice Gate. One of three designed by Krajewski-Pesant Mfg. Corp. for the Bladensburg Sewage Pumping Station of the Washington Suburban Sanitary Dist., Hyattsville, Md. Harry R. Hall, Engineer.

Superior under a wide variety of operating conditions, Everdur* has proved itself through years of dependable, trouble-free performance as the ideal material for sewage equipment.

Rust-proof and corrosion resistant, its high strength makes lightweight construction practicable. Made in practically all commercial forms, Everdur is readily fabricated and welded. And with all these advantages, it is moderate in cost.

For further information write for a copy of Publication E-11. 43123

Other Applications of Everdur:

Coarse and Fine Screens, Float Chambers, Swing Gates, Coarse Bar Rack Aprons, Effluent Weirs and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Anchors, Ladders, Float Gage Chains, Manhole Steps, Guides, Walkways, Bars, Plates, Bolts and Nuts.

*Reg. U.S. Pat. Off.

ANACONDA

Everdur Metal

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Conn.

Subsidiary of Anaconda Copper Mining Company—In Canada: Anaconda American Brass Ltd., *New Toronto, Ont.*

Spring Beautiful Spring

...when a Waterman's fancy turns to Spring Floods

Melting ice and snow cause many of the objectionable tastes in your raw water supply. The spring thaws also wash out the winter's accumulation of decaying vegetation, leaves, trade wastes and other substances on your watershed.

We suggest that you plan now to run regular THRESHOLD ODOR TESTS on your water supply and be prepared with an adequate supply of AQUA NUCHAR Activated Carbon in order to control such tastes and odors which are flushed to your intake.

In conditions like the above, speedy delivery is important. We have therefore arranged to have stocks of AQUA NUCHAR placed at strategic points throughout the country.

BLUEPRINT NOW!

But above all, remember there is a war yet to be won. Maintain equipment to assure operation at 100% efficiency.

NUCHAR

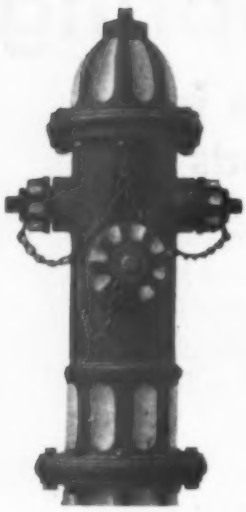
INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y. | 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS | 748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA. | 844 LEADER BLDG., CLEVELAND 14, OHIO

ONLY THE BEST IS GOOD ENOUGH

"I've been in the water works business long enough to know. Cheap equipment costs plenty in the long run. That is why I began years ago to depend upon MUELLER equipment. Mueller's sound engineering plus the finest workmanship result in products that stay on the job for years with a minimum of trouble and upkeep costs."



The MUELLER-COLUMBIAN traffic model is the finest fire hydrant built. The self-oiling top, the money-saving safety-flange section, the rugged main valve with its double bronze-bushed drain valves are the superior features beneath its sturdy, smart appearance. These provide ease of operation and assure a maximum flow of water in a hurry in any weather. . . The MUELLER-COLUMBIAN Gate Valves have the EXCLUSIVE 4-point wedging mechanism in the gate assembly. This eliminates sprung discs that cause leaking and binding. . . Ask for full particulars and our Catalog A-200.

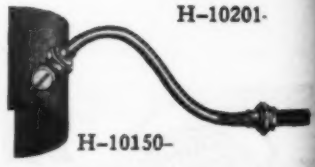
Quality BRASS GOODS

In addition to the stops and gooseneck shown here MUELLER makes many other kinds of brass goods for every water works need. All MUELLER goods have proper content, all keys are individually lapped into their bodies, and each piece is rigidly tested to insure easy operation and no leaks. . . You can depend upon MUELLER. Write for Catalog "H".

H-10002-

H-10201-

H-10219



H-10150-

MUELLER CO. ★ DECATUR, ILL.

The Latest Development in a Mechanical Joint for Cast-Iron Pipe

The "All-in-One" DRESSER Bellmaster Joint

As cast-iron pipe again becomes available, you naturally take keen interest in a faster and better method of joining it. The compact, tight, flexible Dresser Bellmaster Joint, Style 85, offers you both speed and efficiency.

In the Bellmaster, Dresser engineers have developed a mechanical joint of amazing simplicity. Each joint consists of a resilient rubber-compound gasket compressed by capscrews between two light, strong malleable iron rings. It is shipped, stocked and installed completely assembled.

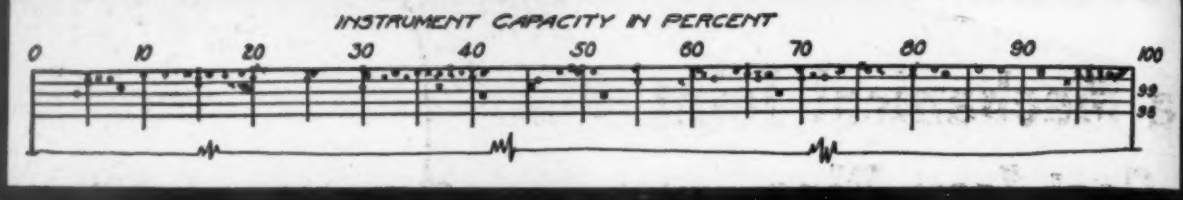
The Dresser Bellmaster makes up tight and stays tight. Automatically absorbing expansion, contraction, deflection and vibration to an unusual degree, it cushions and protects the pipe while maintaining a constant seal. Locked within the bell of the pipe, it is completely enclosed. No outside lugs, no exposed parts to chip or corrode.

Investigate this latest development in a mechanical joint for C I P. Makers can supply Bellmaster pipe, and we are able to ship joints promptly. Sizes—3", 4", 6", 8", 10", 12" and 16".

Catalog 413 ARM on request.

Your workman has only one piece to handle — even the newest man on the job can make up tight joints in from two to five minutes with the Dresser Bellmaster.

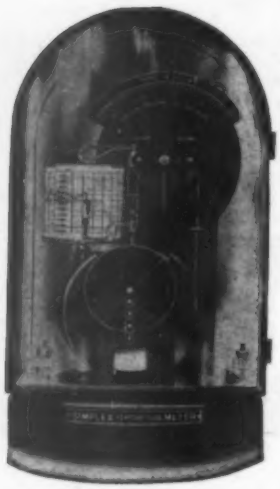
DRESSER MANUFACTURING COMPANY • BRADFORD, PA.



Here is visual proof of the efficiency of Simplex MO Meters taken from Weighed Water and Volumetric tests.

The OVERALL ACCURACY of the SIMPLEX MO METER

AS SHOWN BY WEIGHED WATER and VOLUMETRIC TESTS



The matter of final concern to the user of a flow rate meter is the overall efficiency of the instrument — whether its purpose is to indicate, record, or totalize the flow.

The efficiency of sixteen Simplex MO Meters when tested in place by weighing scales and checked by the volume of standpipes is here illustrated. The data was taken at random from routine records of wide-range tests conducted by the laboratory of Simplex Valve & Meter Co. These accuracies speak for themselves.

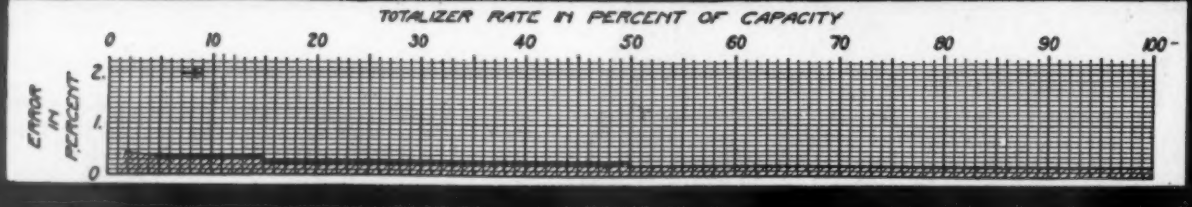
In addition to its inherent accuracy, the Simplex MO Meter operates on a simple trouble-free principle which assures extreme sensitivity over the entire meter range. An applied differential head of 1/8 inch of water or less is sufficient to cause functional operation of this instrument. Any change in the rate of flow through a primary device is instantaneously and accurately recorded on the Simplex Meter Chart.

In the unique totalizer design, a frictionless vertical movement of the assembly occurs with flow changes. Constant speed revolution of a friction disc through the variable horizontal speed of a traction roller integrates the rate of flow. The result is highly dependable, accurate totalization of flows over the entire range of the instrument.

Investigate the exceptional values of the Simplex MO Meter. Write today for Bulletin 300.

SIMPLEX VALVE & METER CO.
6743 UPLAND STREET, PHILA. 42, PA.

An error curve showing totalizer rate in percent of capacity against actual weighed water.



NOW MORE THAN EVER

. . . with Time and Man Power at a Premium . .

LAY YOUR WATER LINES TO LAST

AND STAY OUT OF TROUBLE

★

Give them

LOWER INITIAL LEAKAGE

STAMINA TO TAKE PUNISHMENT

EXTRA RESISTANCE TO THERMAL SHOCK

Joints made with *Tegul*-MINERALEAD show lower initial leakage and resist extraordinary vibration.

If you've read the Power Hammer Test Story, you'll check *Tegul*-MINERALEAD as tops in taking punishment.

As far as we know, *Tegul*-MINERALEAD is the only *practical* compound used in lines carrying hot water.

Tegul-MINERALEAD works at sub zero and at highest summer temperatures.

Tegul-MINERALEAD keeps away from troubles due to chemical change. Correctly mixed at factory, its ingot form admits no possible "shakedown," no matter how rough the ride from plant to point of use.

Tegul-MINERALEAD joints require no skilled labor or deep bell holes.

Weighing only one-fifth as much as lead, *Tegul*-MINERALEAD saves in shipping and handling costs. It is not a critical war metal or material.

Impervious to moisture, *Tegul*-MINERALEAD may be stored in the open regardless of weather . . . even of possible flood conditions.

SAVE TIME, LABOR . . . . MONEY TOO

BY USING

***Tegul*-MINERALEAD**

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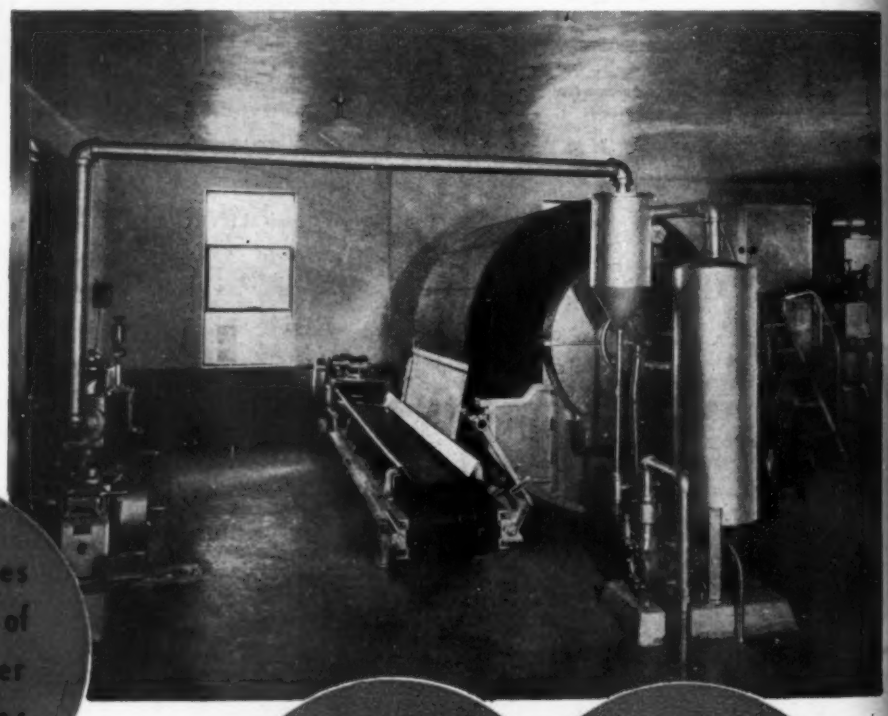

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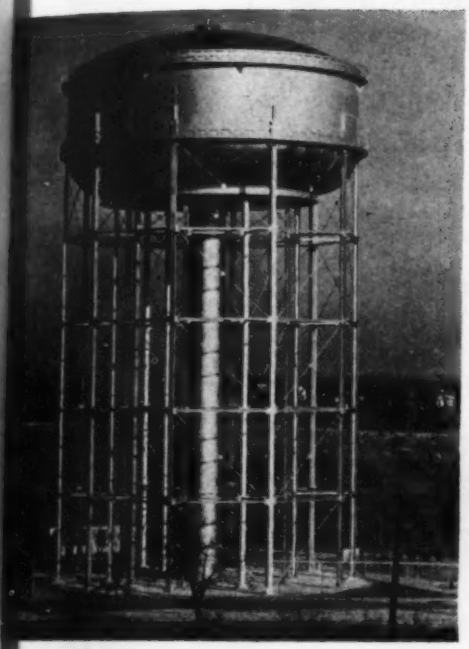

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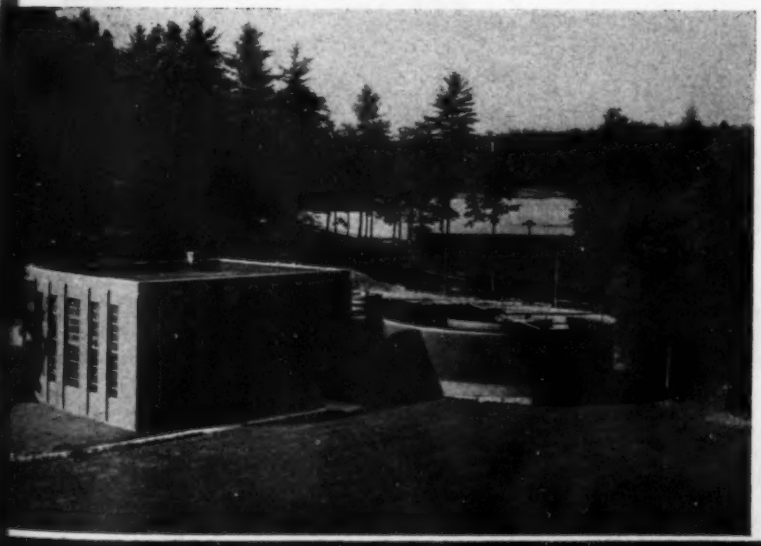

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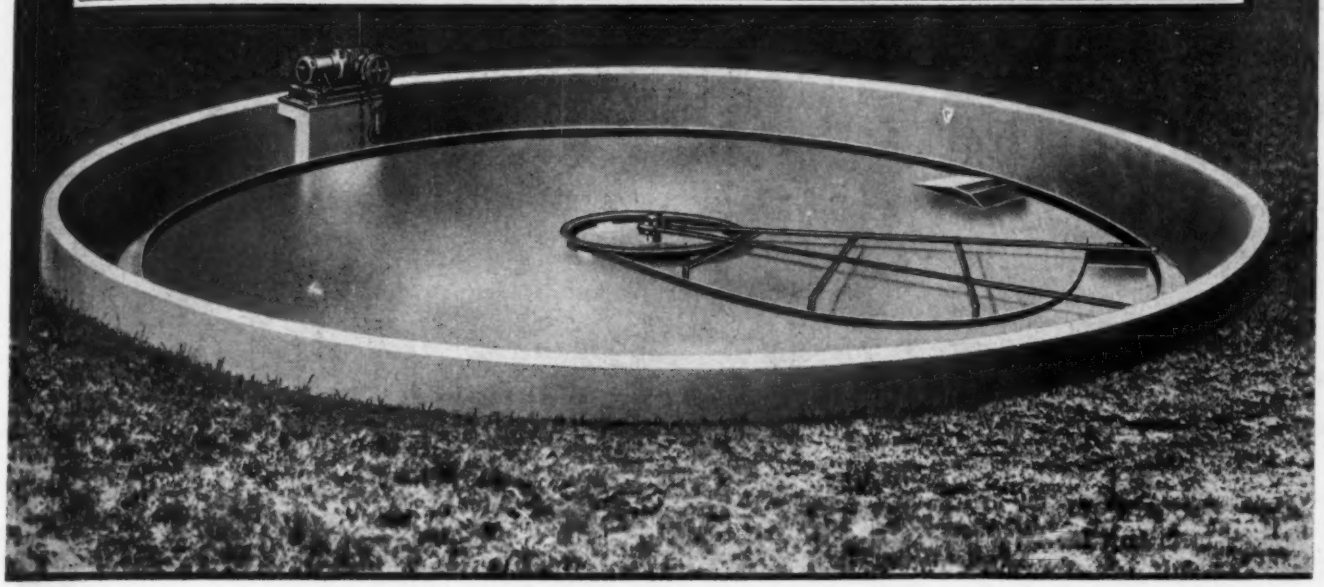

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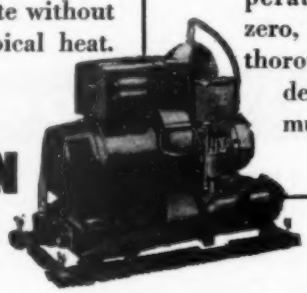

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IN the postwar world of scientific improvements and streamlined designs, the Watersphere may well become a familiar sight at many cities. The layman never has to be sold on this type of elevated storage, for the beauty of these structures is immediately apparent. To the engineer, however, the Watersphere is probably more intriguing from the standpoint of its highly functional construction.

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The 50,000-gal. Watersphere shown in the pictorial view at the left was installed in Travis County, Texas. It is 110 ft. to bottom and provides gravity pressure for both domestic and commercial users. The water supply is pumped from a well 468 ft. deep. There are 30 mi. of mains from 2 to 8 in. in diam. in the distribution system.

The beauty and practicability of the Horton Watersphere warrants consideration of this structure in the planning of postwar water supply systems.

• *The Watersphere at the right is a 100,000-gal. structure 100 ft. to bottom located at Madison, Wis. In one locality, prior to its installation, pressure varied more than 75 lbs. Since the erection of the Watersphere, pressure conditions have been stabilized, with no great fluctuations. Similarly, pressure charts taken at several locations throughout the system show an almost unbelievable drop in pressure variations.*

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At Left—Lining up for safe drinking water purified with HOODCHLOR on New Georgia Island. Official photos courtesy of U. S. Army Engineers.

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The four paragraphs on the left give an accurate resumé of Calgon's action in various phases of this preventive treatment. Read them carefully.

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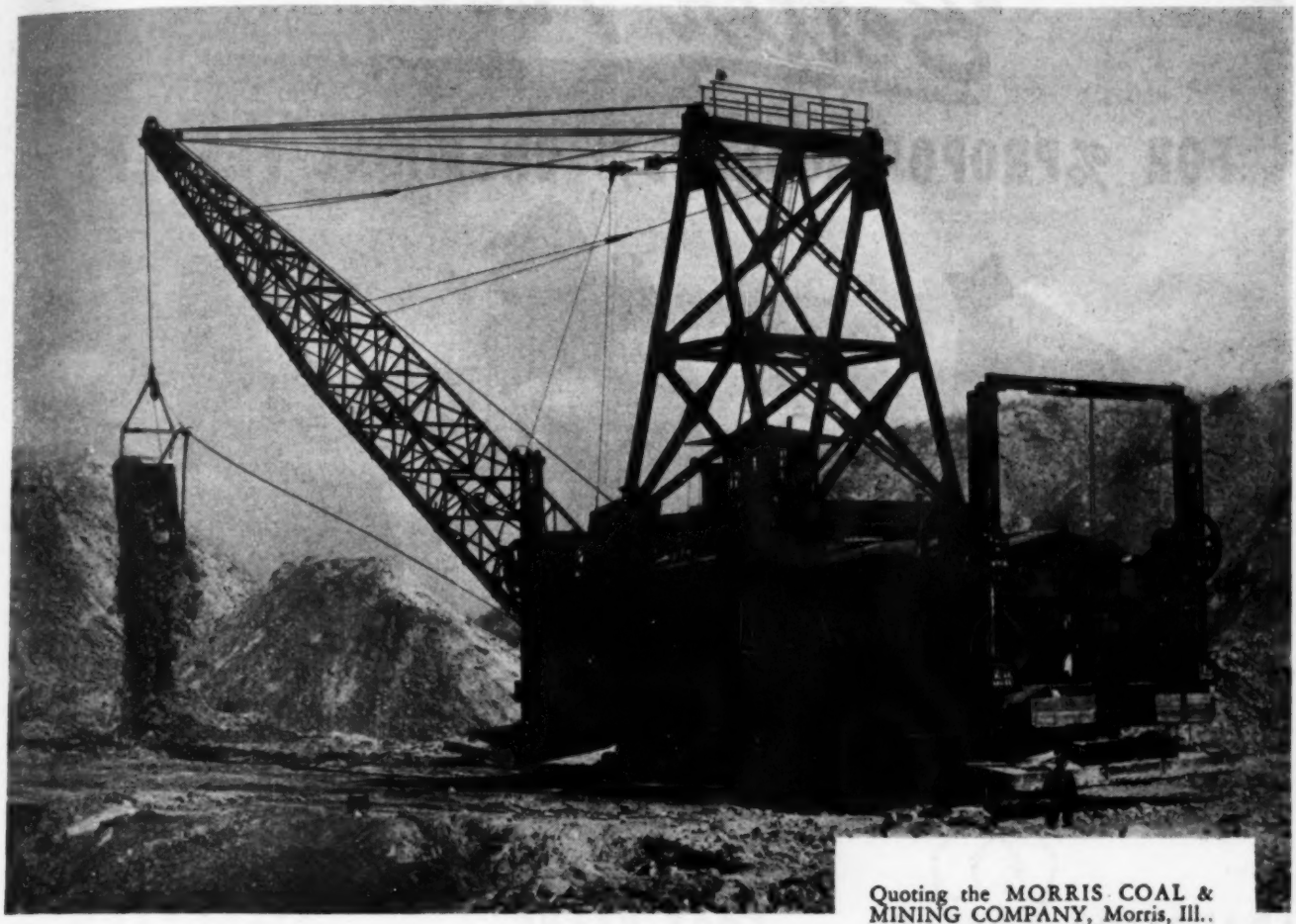

Coal is a form of carbon precious to mining men—but they have learned, as water works engineers have, that hard, black carbon on rings, pistons, valves is a destructive and wasteful thing.

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COMING!

"The Advantages from Waterworks and Sewerage Under One Management"

Are related by one who has now had several years of experience as head of the sewerage system as well as the water supply system of a thriving small city. In as much as the general trend is in the direction of combined operation and management of these two closely allied public utilities, this article will serve to clarify the minds of those who contemplate the coming of joint operation of these two utilities in their home community. The enthusiastic author is—

JOHN W. PRAY,
Manager of Utilities, Fort Dodge, Ia.

"A System of Planned Maintenance"

Like many another water supply practice that is progressively out in front in the operation of the St. Louis County Water Co., the system of "Planned Maintenance" which has proved its worth to this efficiently operated and maintained water utility is to be described by—

VANCE C. LISCHER and
HERBERT O. HARTUNG,
Production Engr. and Sanitary Engineer,
St. Louis County (Mo.) Water Co.

"An Example of, and Experience With, Water Supply System Interconnections"

Is a story descriptive of the scheme followed in interconnecting the municipally owned supply system of Buffalo, N. Y., with the privately owned supply system of the Western N. Y. Water Co. The most interesting part of this story is the fact that these interconnections were hardly completed before an emergency was experienced, and the value of the hook-up between the two systems could be promptly and gratifyingly demonstrated. This is but one result of the introduction of the Mutual Aid Program in New York State, and the Buffalo story bids fair to encourage many other municipalities, and water utilities generally, to arrange interconnections between contiguous water systems. Many will find this article interesting and suggestive reading. The authors are—

NEWELL L. NUSSBAUMER,
Commissioner of Public Works, Buffalo, N. Y.; and
ALFRED KREHBIEL,
Town Engineer, Tonawanda, N. Y.

"Operating Experiences at Gary, Indiana"

Tells of problems and their solution at the extremely interesting activated sludge plant of Gary, Ind., where steel pickling wastes in moderation have proved beneficial, if not money saving also, while diffuser clogging has been a problem as the result of the iron wastes in excess. Amongst many other interesting disclosures of operating experiences, exceptional plant performance and low cost of treatment, the article reveals the effects of "controlled iron wastes," diffuser cleaning and an effective measure of retarding tube clogging amongst other advantages of tubular diffusers. The author is—

WM. W. MATHEWS,
Supt. of the Sanitary District of Gary, Ind.

"The Sludge Index in Plant Operation Control"

Is an article which reveals how the "Sludge Index" can be applied in routine control of activated sludge plant operation. The author, with many years of operating experience at Milwaukee and Indianapolis, offers some new slants on how the "Sludge Index" may serve as an operating guide in adjusting sludge return rates, sludge concentration in the mixed liquor (aerators) and in the final clarifiers. This article comes from—

DON E. BLOODGOOD,
Former Supt. at Indianapolis and now Assoc. Professor of Sanitary Engineering, Purdue Univ.

NOTE: Readers will observe in this issue an article by Marsden C. Smith of Richmond, Va., on the topic water quality depreciation in distribution systems. This article is offered as a substitute for his "Standards of Water Service" previously promised, but delayed temporarily due to developments beyond the control of the author.

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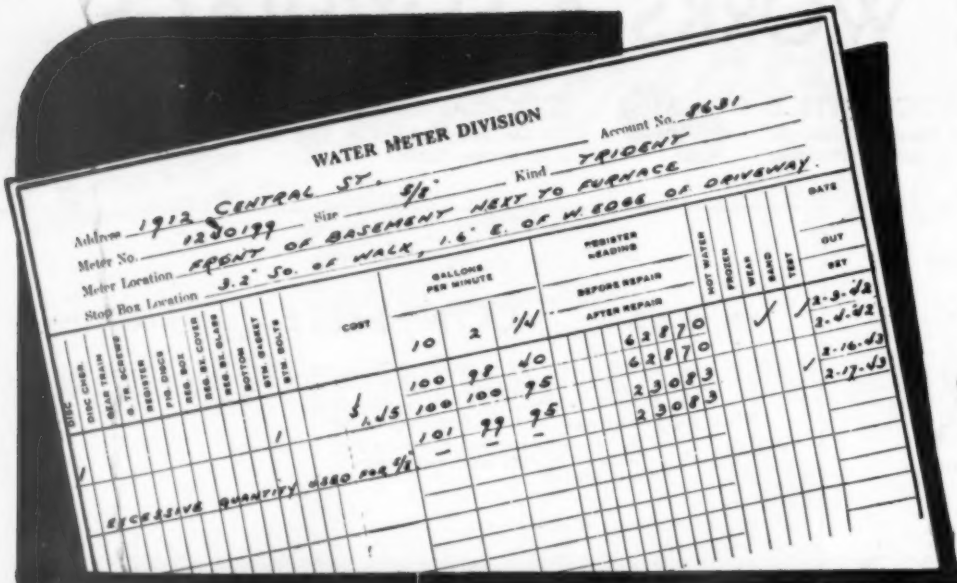

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WATER WORKS & SEWERAGE

VOL. 91. No. 3 *A Gillette Publication* MARCH, 1944

FINANCING SEWAGE WORKS IMPROVEMENTS

Simplified Markedly Through a New Plan Developed in Ohio

By W. R. LA DUE
Supt. and Chief Engineer
BUREAU OF WATER AND SEWERAGE
AKRON, OHIO

SINCE the turn of the century Akron, Ohio, has been an important industrial city. As such it encountered a phenomenal growth during and immediately after World War I; suffered in the lean years of the early twenties; rose to a peak of industrial effort culminating with the panic year 1929; cared for helpless thousands of workers out of jobs through the depression years of the thirties; and, now, in the midst of a second World War, finds in itself a marvel of war production effort with more than a billion dollars in prime contracts poured into Akron's war plants since Pearl Harbor.

Since Akron has been an industrial city, so it will undoubtedly remain, to receive its share of the heritage of World War II. The strange legacies of its rapid growth have produced many unusual problems in municipal planning, financing and engineering. The most prominent efforts have been those pertaining to water supply and sewage treatment.

Akron's Water Supply

Akron's water supply began in 1880 with developments by private capital. By 1910 it became quite evident that private capital either would not or could not take the risk of the larger capital investment necessary to abandon the old supply and to develop a new source more satisfactory in quality and more adequate in quantity to meet the needs of the growing city.

Therefore, in April, 1912, with public acclaim and demand the City of Akron acquired the privately-owned water utility. In three years, subsequent to this acquisition, the present source of supply was selected

The Author

and treatment and pumping facilities were built and placed in operation in August, 1915. Then came a tremendous expansion of the distribution system made necessary by the phenomenal growth of the city during the 15-year period that followed. With numerous plant expansions, capital investment in the water utility continued to pyramid from the original purchase price of $920,000 to approximately $18,000,000 by 1940, shown in tabulation as follows:

BONDS SOLD FOR

Years	Capital Investments	Total Investments
1912-15.....	$4,580,000	$ 4,580,000
1916-20.....	5,425,000	10,005,000
1921-25.....	2,200,000	12,205,000
1926-30.....	3,478,000	15,683,000
1931-35.....	606,000	16,289,000
1936-40.....	1,139,000	17,428,000
1941-43.....	700,000	18,128,000

The acquisition of the original plant and enlargement through subequent construction were all financed by the sale of general city bonds further secured by water revenues.

At the time of acquisition in 1912 water was selling for a dollar per thousand cubic feet, with a minimum charge of $1.50 per quarter. In order to provide for the numerous improvements, effective April 1, 1916, the price of water was established at $1.20 per thousand cubic feet, with minimum domestic rate of $3 quarterly. This was followed on January 1, 1921, by a further increase to $1.60 per thousand cubic feet, with a minimum charge for domestic usage of $3.60 for quarter.

This latter rate remained in effect until January 1, 1933, when, to combat the reaction following rate reductions by both private gas and electric utilities, the city administration reduced the minimum domestic bill from $3.60 to $3 per quarter. This rate remained in effect until 1934, when crowning a five-year effort the discount system for payment of water bills came into being. The rate per thousand cubic feet remained at $1.60, but the minimum bill for domestic consumers was set at $3.60 gross and $3.20 net per quarter. Continued reduction in debt service permitted the water rate to be reduced later in 1941 from $1.60 to $1.50 per thousand cubic feet and a reduction in the minimum bill to $3.40 gross and $3.00 net per quarter.

Operating and maintenance costs, as well as debt service, have naturally fluctuated with changing conditions. However, income from the established rates, with the exception of two periods 1921-1924 and 1932 to 1935 have been adequate to meet operation costs and debt service charges. Since 1940 the income has increased steadily with increased production until at the present time the revenue from the sale of water is approximately $1,500,000 per year. Debt service charges have steadily declined from the peak of over one million dollars in 1937, when 70c to 75c out of each dollar collected was required to meet debt service. Expenditures for operation and main-

tenance of the water utility for the decade of the '30's varied from $300,000 to $400,000 annually. Due to increased costs of both labor and material and to increased output, expenditures have risen to about $450,000 for 1943. The future picture forecasts a steady income of about the same amounts as '43, a fairly even operating cost and a declining debt service load. The following table indicates the picture:

Table I

Year	Income from Sales	Debt Service*	Operating and Maintenance Costs
1915	$ 275,000	$ 187,000	$100,000
1920	819,000	602,000	423,000
1925	1,093,500	824,000	347,000
1930	1,315,400	1,053,000	410,000
1935	1,196,000	877,000	280,000
1937	1,274,000	1,080,000	328,000
1940	1,350,000	1,013,000	362,000
1943	1,519,000	807,000	454,000

*Debt service for the original purchase carried by General City Funds.

Sewage Disposal in Akron

Let us now turn to the sewage disposal problem. The history of sewage treatment in Akron has been turbulent from the beginning. Due to excessive stream pollution the present plant was built upon mandatory orders received from the Ohio State Department of Health. Bonds were issued under authority of an Ohio law which under such orders permits procedure by ordinance of a City Council, without approval of the electorate, to build sewage treatment plants to abate a nuisance. Incidentally, the electorate on two previous occasions defeated bond issues to authorize the sale of bonds for this purpose. As a consequence of this procedure, all debt service charges to meet the bond requirements had to be met out of the city's operating tax revenues. Construction was undertaken during the years 1927 and 1928, and the plant was placed in operation on December 11, 1928.

The plant was originally designed to handle an average daily flow of 33 M.G., a maximum rate of 93 M.G., and a dry solids load of 25 tons daily and anticipated an expansion around 1935. The capacity of the plant was reached prior to 1935 insofar as the solids load was concerned, and the average daily flow was reached at approximately the time anticipated in the design.

The depression of the early '30's made it very difficult for the city to provide funds from tax revenues for operation and maintenance, much less for plant expansion. The reduction in valuations of the tax duplicate for the City of Akron sent the percentage of indebtedness incurred over the maximum permitted by tatute, making it impossible to sell bonds for plant additions. During the period of W. P. A. and P. W. A. existence, the Ohio statutes governing the sale of bonds were amended to permit the issuance of bonds exceeding the statutory limitation in those cases where work relief resulted and where the federal government participated in the cost. In this program, two digestion tanks were constructed with the Federal Government participating in the cost.

In order to maintain sufficient plant capacity, lagooning of sludge has become necessary since the early '30's. The large industries of Akron, especially rubber reclaiming plants, were requested to reduce the solids content of the wastes discharged. Willing cooperation was given in most every instance with gratifying results in reduction of the solids load. With the advent of war industries a decided change in the solids problems has occurred, both in the character of the solids encountered and in its quantity, which in spite of all efforts, has steadily increased to an excess of 85 tons per day. By no means the least of these problems are the changes resulting from the development and use of synthetic rubber to replace natural rubber and in the increased activities in reclaiming processes.

Since 1923 Ohio statutes have provided for the application of so-called "sewer rental" to provide funds for the operation, maintenance, and expansion of sewerage systems and sewage treatment plants.

It has indeed proven most unfortunate that Akron had not availed itself of this law at the time of construction of the plant, however, it appears to have been considered as still in the experimental stage at that time. In 1935 efforts were made to place a sewer rental law into effect. Industry was contacted and agreed to the levying of a tax in an amount sufficient to provide for the operation, maintenance and expansion of the sewage treatment plant. However, the City administration then in office, in addition to requesting amounts sufficient to provide for the above functions desired additional revenues sufficient for the maintenance and extension of main trunk sewers, for the retirement of bonds previously issued for existing main trunks, and for future sanitary sewer construction. Inasmuch as there was no meeting of minds, the legislation died before reaching Council for consideration. On several occasions since 1935, sewer rental ordinances have been presented to Council, but were either rejected or did not reach a vote. Minority pressure groups have been exceedingly active in preventing the adoption of sewer rental; one of the most active groups being an association of home owners. Their main argument has been that sewer rental duplicates taxation, since bonds had been issued for the building of the treatment plant together with the necessary sewers and that apparently all charges had been met heretofore by a tax levy on real estate. Unfortunately, this argument has been difficult to combat since the plant has continued to operate—perhaps not as it should—but it has operated.

Suggested Schemes of Financing Sewage Treatment

The increasing revenue from the sale of water has been quite apparent. A declining water debt service load likewise cannot be denied. It is not strange therefore that many schemes should be devised to divert funds from waterworks surpluses for the rehabilitation of the sewage treatment plant and to assuage the acute sewage treatment problem. Most of these schemes have been based upon a more or less illogical but nevertheless bothersome reduction of water rates. Just two will be mentioned. One suggested scheme called for a deduction of 75c from each minimum water bill (all rates other than those having a direct bearing on the minimum bill to remain unchanged) and this 75c was in turn to be assessed against the consumer as a sewer rental charge. The other scheme was to effect an arbitrary annual reduction in water revenues amounting to $300,000 to be offset by a levy of the same amount against properties in the form of sewer rentals. Reductions of this nature meant that the water utility would be arbitrarily forced to operate "in the red" for several years until reduced debt charges in future years evened the score. Proponents of both plans contended that each was sound because the charge for both water and sewer rentals would not exceed the original water bill.

State Statutes Governing Use of Water Works Funds

For many years the Akron Bureau

of Water had operated under a state statute or code which read in part as follows:

"Sec. 3956. *Duties of director of public service.* The director of public service shall manage, conduct and control the water works, furnish supplies of water, collect water rents, and appoint necessary officers and agents."

"Sec. 3957. *By-laws and regulations.* Such director may make such by-laws and regulations as he deems necessary for the safe, economical and efficient management and protection of the water works. Such by-laws and regulations shall have the same validity as ordinances when not repugnant thereto or to the constitution or laws of the state."

"Sec. 3958. *Assessment and collection of water rents.* For the purpose of paying the expenses of conducting and managing the water works, such director may assess and collect from time to time a water rent of sufficient amount in such manner as he deems most equitable upon all tenements and premises supplied with water. When more than one tenant or water taker is supplied with one hydrant or off the same pipe, and when the assessments therefor are not paid when due, the director shall look directly to the owner of the property for so much of the water rent thereof as remains unpaid, which shall be collected in the same manner as other city taxes."

"Sec. 3959. *Disposition of surplus; how taxes applied.* After paying the expenses of conducting and managing the water works, and surplus therefrom may be applied to the repairs, enlargement or extension of the works or of the reservoirs, the payment of the interest of any loan made for their construction or for the creation of a sinking fund for the liquidation of the debt. The amount authorized to be levied and assessed for water works purposes shall be applied by the council to the creation of the sinking fund for the payment of the indebtedness incurred for the construction and extension of water works and for no other purpose whatever."

Three provisions of this code are important.

First, the prerogative of the Director of Public Service to fix water rates has been zealously guarded.

Second, funds, designated as water revenues have been carefully segregated and deposited for the use of the water works, *and water works only.*

Third, a definition of a real surplus and its use has remained somewhat obscure.

The requirement of the statute making mandatory the segregation of water work funds has resulted in other branches of municipal service casting longing eyes at the balances carried, and resulted in schemes, both legal and illegal, to gain access to these funds. It has resulted in the refusal of self-supporting City and quasi-public functions to pay their legitimate water bills. It has caused agitation for construction from these funds of projects not a part of the water works system but obviously for "rental" to other departments. This longing during depression years resulted in the passage of an act of the Ohio Legislature, permitting the diversion of 3% of the *gross revenue* of the water works to poor relief with open disregard for the condition of the department as to "red" or "black." The association of water works funds with the job of feeding and housing of the poor is definitely hard to correlate. Now, even with the advent of better times, the desire for diversion has persisted.

Code Amended to Give Sewage Disposal First Call on Water Surplus

In many states the use of water works funds for municipal operations is openly practiced. Water Works, in the main, being well operated, are looked upon as opulent and hence are placed continually on guard. As a means of providing a more positive check upon the misuse of water works funds; of reducing the desire to divert funds for sundry purposes, and, more particularly, of preventing unnecessary and ofttimes devastating reductions in water rates; enactment was secured on May 26, 1943 of the following act of the Ohio Legislature amending and clarifying Sec. 3959 of the General Code to read as follows:

"Sec. 3959. After paying the expenses of conducting and managing the water works, any surplus therefrom may be applied to the repairs, enlargement or extension of the works or of the reservoirs, the payment of the interest of any loan made for their construction or for the creation of a sinking fund for the liquidation of the debt. Provided, however, that in those cities where water works and sewerage systems are conducted as a single unit under one operating management a sum not to exceed ten per centum of the gross revenue of the water works for the preceding year may be taken from any surplus remaining after all of the preceding purposes have been cared for and may be used for the payment of the cost of maintenance, operation and repair of the sewerage system and sewage pumping, treatment and disposal works and for the enlargement or replacement of the same, provided, however, that each year a sum equal to five per centum of the gross revenue of the preceding year be first retained from said surplus as a reserve for water works purposes.

The amount authorized to be levied and assessed for water works purposes shall be applied by the council to the creation of the sinking fund for the payment of the indebtedness incurred for the construction and extension of water works and for no other purpose whatsoever."

Several public hearings were held on this section, at which all requests for clarification were satisfied, before the Legislature approved it. The Governor signed the bill on June 8th, 1943, with the effective date ninety days thereafter. This act was fostered by officials of the City of Akron and local state legislators and most of the support for its passage came from this same source.

It is to be noted that the bill provides several pertinent features:

First: The new law goes further than the original statute by defining "surplus" as that portion of water revenue *remaining* after paying the expenses of conducting and managing the water works, paying for the repairs, enlargement or extension of the works or of the reservoirs, the payment of the interest of any loan for their construction, or for the creation of a sinking fund for the liquidation of the debt.

Second: A water works reserve is provided for in advance of any diversion of funds for sewerage purposes. This amounts to 5% of the gross revenue and the water utility, thereby, is assured first claim upon the water works surplus as defined. This 5% reserve is an annual deduction and is cumulative and the water reserve from previous years is not used in the computation of any current year's surplus. This water reserve may be expended at the discretion of the Service Director for water works repairs, replacements, new installations or extensions, in lieu of bond fund expenditures or to provide carrying charges for bond fund expenditures.

Third: It provides that 10% of the *gross* revenue of the water works may be taken from this *surplus* to provide only for the payment of the cost of maintenance, operation and repair of the sewerage system and sewage pumping, treatment and disposal works, or *for the enlargement or replacement of the same.*

Fourth: The amended act further provides that before diversion of funds can be made for sewerage purposes, both the water works and sewerage systems must be conducted as a single unit, *under one operating management.* This does not mean under the management of the Director of Public Service, but rather sets up a *combined* operation under the management of a division head, responsible to the Director of Public Service. The sponsor of this amendment had in mind making absolutely certain that proper operation of the water works would be amply provided for *prior* to permitting any diversion of water works funds. This safeguard has been incorporated in the act by the following sentence: "10 per centum of the gross revenue of the water works for the preceding year may be taken from any surplus remaining after all of the preceding purposes have been cared for." The term "preceding purposes" refers back to the first portion of the act.

Attention is particularly directed to the "single unit" provision of the act, since it permits maximum flexibility in the control of funds by the person in charge of combined operations of the water and sewerage systems and insures the proper usage of funds thereby indirectly, but effectively, governing and controlling the amount of funds available for surplus.

An immediate benefit of the act has resulted. The Legislature, in renewing the act permitting 3% diversion for poor relief if desired by a Council, has included a provision that the total diversion of water

works funds by legislative act for all purposes shall not exceed 10% of the gross revenue of a current year. Inasmuch as diversion for poor relief and for sewerage purposes are the only ones possible under existing laws, the legislature has cooperated to the extent of limiting all present diversion of water works funds to 10% of the gross water works revenue. This means that in those cities requiring and desiring 3% for poor relief, only 7% can be diverted for sewerage purposes.

Attention is further directed to the provision that, if the surplus, as above defined, provides an amount in excess of 15% (5% for a reserve water works fund, 10% for diversion to sewerage purposes) of the gross revenue, then the amount in excess of the 15% remains a part of the water works funds. Such excess can be used for any well-advised rate reduction plan which would in no wise restrict the efficiency of plant operations. These provisions will cause ill-advised proposals for rate changes to receive very careful scrutiny before being presented. Any change tending to reduce or remove the *surplus* will eradicate the benefits derived from use of that surplus.

A practical financial illustration of the treatment of a year's revenue under this act would be applied as shown in Table II.

With the management of both the water works and sewerage divisions of Akron under one operating head, it is therefore believed possible under Ohio laws to divert up to

Table II

Annual Gross Water Revenue		$1,500,000
Annual Water Works Operation	$450,000	
Annual Water Works Extension	100,000	
Annual Debt Service	700,000	
TOTAL		1,250,000
SURPLUS		$ 250,000
5% Water Works Reserve	$ 75,000	
10% Diversion to Sewerage Operation	150,000	225,000
Balance of surplus remaining in Water Works Funds		$ 25,000

$150,000 annually toward the functions of sewage works. It is believed to be feasible that this amount of money, annually diverted and further secured by a dormant sewer rental law would be sufficient under the present money market to service the debt incurred for a 2½ to 3 million dollar Sewage Treatment Plant Improvement Program. This assumption is based on the issuance of 25-year serial bonds under the Ohio Uniform Bond Act which provides for equal annual retirements of bonds, together with interest payments. Issuance of revenue bonds by act of Council would also receive consideration. The additional security of a Sewer Rental Law enacted by Council, even though allowed to remain dormant until needed, appears desirable to make the bonds attractive and saleable.

Use of Water Works Surplus in Postwar Sewerage Construction

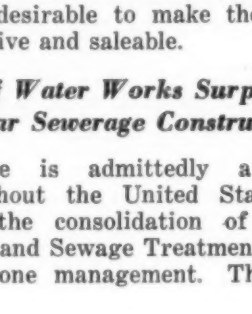
There is admittedly a trend throughout the United States toward the consolidation of Water Works and Sewage Treatment plants under one management. This presents many and varied new problems, all of which are by no means undesirable, however shocking they may appear at first blush. The main thing is that it is *new* and consequently requires *new* thinking.

It is believed that the principles set forth in this new Ohio act are sound and that any solvent water works and sewage treatment plant operated together can be benefited thereby in the development of its postwar operations and improvements. It is admittedly a violation of and an infringement upon the old principle that water works funds are inviolate. The possibility of the diversion of water funds has proven a nightmare to which most water works men are allergic. However, it is believed and submitted that the new Ohio law has many decided advantages and safeguards. Its further possibilities for assisting in solving the financial problems attendant to postwar planning and construction are likewise submitted for deserved consideration.

Reference—Journal A.W.W.A. Vol. 29, No. 10, October, 1937.

Tom Skinker Elevated to St. Louis Utilities Director

Marking a new departure in the appointment of members to the Mayor's Cabinet in St. Louis was the recent elevation of Tom Skinker, a career man in the Dept. of Water in St. Louis. This precedent breaking move by Mayor Aloys P. Kaufmann marked the first time a city employee had risen through the ranks of his department to become a Director on the Board of Public Service.



Tom Skinker

Tom Skinker entered the St. Louis Water Dept. in 1913 and after several promotions became Division Engineer in 1924, a job he held until 1937 when politics stepped in and relieved him of this position. In 1941 a new administration recognized Mr. Skinker's value to the Water Department and made him Water Commissioner, from which position he is being upped to Director of Public Utilities.

As Utilities Director Mr. Skinker will be a member of the Board of Public Service which must approve all plans and let all contracts for public improvements. Mr. Skinker succeeds Milton M. Kinsey who was appointed as President of the Board of Public Service. Succeeding Mr. Skinker as Water Commissioner is Elton E. Easterday formerly Division Engineer in the Water Department. No replacement for Mr. Easterday has been named.

Members of AWWA, a large number of whom are personal friends, will welcome this news about Tom Skinker with sincere congratulations both to "Tom" whose long service merits recognition and to the Mayor for recognizing the merits of such a good "Water Man".

THE WEST VIRGINIA CONFERENCE

(A Delayed Report)

DOWN in "Scot," Highland's home town of Clarksburg, W. Va., on November 4th there assembled 200 or more members and guests of the West Virginia Section of A. W. W. A. and the 18-year-old

Chairmen

(Retiring)
H. W. Speiden
Prof. Civil Eng.
Univ. W. Va.
Morgantown, W. V.

(Incoming)
J. C. Edwards
Ass't Manager
Htgtn. Water Co.
Huntington, W. Va.

W. Va. Conference on Water Purification for a two-day meeting which boasted a well coordinated program featuring topics of wartime and post-war interest and importance.

Early on the program, and very appropriately so, was presented a laudably prepared paper outlining the need for a "Water Conservation Plan for the West Fork River Basin." This paper was prepared and presented by Scotland G. Highland, General Manager of the Clarksburg Water Board, who outlined the history of the water supply problems of Clarksburg and other communities of the West Fork River Basin and cited the water supply needs of the valley and plans calling for 25 billion gallons storage and stream regulation reservoir to be located on the river above Fairmont, W. Va. After reciting the history of drought and flood conditions of the West Fork River Valley, the high variation in water quality as well as quantity, and citing the great need for stream flow regulation and insured abundant supply, Mr. Highland made an impassioned plea to the people of this industrially rich valley to support and work for the establishment of a Conservancy District and water supply and stream control program. His paper was printed in full in the leading newspapers of Clarksburg, and deservedly so.

Mr. Highland revealed that it was the failure of water supply during a conflagration that caused the city to take over the water supply system and rebuild it in 1889. Then came the drought of 1908, in which a second failure of supply caused the establishment of the independent Clarksburg Water Board to manage and operate the system formerly operated by Council. The most serious drought in the state's history was that of 1930, lasting for 294 days—almost 10 months of no precipitation. Surprising to many was the revelation that the state's most serious and costly floods had been those of August, 1943. In his paper, addressed to the citizenry, he made a point of the fact that one of the Nation's largest and certainly most important industries was that of producing and delivering into every home pure wholesome water with non-failing service 24 hours of every day, and the subsequent disposal of this same water after its use to carry away the wastes of the community and industrial establishments.

In reporting the Joint Meeting of the West Virginia Section of A.W.W.A. and the 18th Annual Conference on Water Purification at this late date we have a decided feeling of being in the well known situation of "be damned if you do — and, be damned if you don't!"

We might as well begin by admitting that with the paper situation what it developed into late in 1943, we just bit off a little more than we could chew in the way of attending sectional meetings, with the idea of following the usual custom of reporting the proceedings — and printing pictures taken, of officers, "programmers" and others in attendance. For printing "stale news" we will be criticized by many, but we feel, in as much as we have been unable to attend and report a West Virginia Conference for some time, that we must take the criticism of others in order to keep faith with our good friends, the "Mountaineers," who hold such well coordinated and enthusiastically-attended meetings.

In this direction our one regret is that it is to be necessary to abbreviate the report to the degree demanded by the present situation. In consequence we offer our apologies to any program participant who may feel that he has been slighted in this report.—Ed.

No. 1 Host

Scotland Highland
Gen'l Manager
Water Board
Clarksburg, W. Va.

Awardee

Jos. K. Buchanan
Vice-Pres.
Monongahela Utl.
Fairmont, W. Va.

Secy.-Treas. and Trustee

J. B. Harrington
Chief Engr.
State Dept. Health
Charleston, W. Va.

Cable H. Cramer
Mgr., C. K. & C.
Water Co.
Kenova, W. Va.

Buchanan Voted Fuller Award

J. K. (Joe) Buchanan, Vice President of Monongahela Utilities, Fairmont, W. Va., was voted the George W. Fuller Memorial Award for 1943 "In recognition of his long continued interest in the West Virginia Conference on Water Purification and the newer West Virginia Section of A. W. W. A. for their inception, his ability as an executive, his leadership in water works utilities, and his inspiration to all of these meetings through his genial conduct as master of ceremonies at the annual dinners." The latter part of the citation may be a bit garbled but the meaning was as it is given. Having seen "Jo" Buchanan preside at several of these West Virginia dinners, we heartily applaud the recognition and an unexpected honor which found him tongue-tied for perhaps the first time in his many sittings at head tables.

Officers Named

The following were declared officers for the year ensuing:

Chairman—J. C. Edwards, Asst. Manager, Huntington Water Co., Huntington, W. Va.

Vice Chairman—Paul D. Simmons,

Programmers

Martin Flentje
Pur'if Eng'r
Am. Water Wks. & Elec. Co.
New York, N. Y.

D. E. Davis
The Chester Engineers
Pittsburgh, Pa.

M. H. Martin
Manager
Water Co.
East Rainelle, W. Va.

J. B. Douglas
Engineer
W. Va. Water Service Co.
Charleston

Earle Johnson
Distr. Mgr.
W. & T. Co.
Pittsburgh, Pa.

Chemist, Weirton Improvement Co., Weirton, W. Va.

Secy.-Treas.—John B. Harrington, Chief Engr., State Dept. Health, Charleston, W. Va.

Trustees—H. Cable Cramer, Supt., Kenova, W. Va.; Dennis Clark, Supt., Welch, W. Va.; D. V. Moses, Chem. Engr., Charleston, W. Va.

A. W. W. A. Director from the W. Va. Section is T. L. Young, Manager, Southside Water Co., Chester, W. Va.

Technical Sessions

(Prof. H. W. Speiden, presiding)

"Billing and Collecting for Water Service in Wartime" was discussed by M. H. Martin, Supt., East Rainelle, W. Va., plant of the W. Va. Water Service Co., who presented the results from a questionnaire mailed to a number of publicly and privately operated plants. One thing that the questionnaire revealed was that there is a complete lack of uniformity of practices in billing and collecting by W. Va. water utilities. About 33 per cent required meter deposits. Half billed monthly and half quarterly. When a meter can't be read, the consumer is rendered minimum bill by half those replying and the other half renders estimated bills. The minimum charge varies from $1.00 to $1.85 per month and 2,000 gals. allowed. The flat rate is $1.00 also. Past due bill notices are sent out by the great majority and apparently results in early payments. Only about half print warnings of service shutoff for non-payment after a deadline date, and the same ratio applies to the shutoff practice.

Vice-Chm'n
Paul Simmons
Chemist
Weirton Imp. Co.
Weirton, W. Va.

Director
T. L. Young
Manager
S. S. Water Co.
Chester, W. Va.

The great majority require bill payment in the current month and are so paid by 85 to 95 per cent of the customers. The majority allow 60 days before the service is shut off and two-thirds charge for the turn-on. Adding a 10 per cent penalty for failure to pay within time limit is considered effective by two-thirds replying, but for psychological effect the allowance of a discount for prompt payment is preferred. To collect old accounts, suits are not brought in W. Va. Leaks on customers' premises are surveyed by two-thirds without charge. About half make no allowance on bills when leaks are shown to be the cause and about half do make adjustments up to one-half the excess of the bill. When a meter is over-read and it is detected, no refund is made but a credit appears in the following bill. That the shut-off system for non-payment does not create ill will of neighbor customers is the unanimous opinion.

Jordan on "Blueprinting Now"

Harry E. Jordan, Secy. of A. W. W. A., told of the program of the Joint Committee on Water and Sewage Works Development and the need for being ready to start water and sewage improvements as early as permissible for post-war projects and cited the fact that privately owned water plants should also be strengthened as a measure of looking to the future and a legitimate use of surplus funds resulting from deferred maintenance and improvements. As to deferred maintenance, the record for the Nation at large indicates that this item represents now about $200 per year per 1,000 persons served and must be taken care of at the earliest opportunity. He said that water works men owed it to themselves and their community to be ready with improvement plans and their part was to participate in whatever local program there might be under development, *but* be prepared.

Following Mr. Jordan, Charles J. Bruce, Supt., Evitts Creek Water Co., Cumberland, Md., told of the orderly plans for post-war improvements being developed by Cumberland. A nationally known firm of consulting sanitary engineers was making a study of all needs of the city, with the idea of integrating the entire program and establishing a priority schedule of first things first. Just where water and sewerage betterments were to fit into the picture as a whole was to be determined by this firm. In Mr. Bruce's opinion,

Floyd Johnson
Muller Co.
Nashville, Tenn.

Paul Riffee, Supt.
Shinnston, W. Va.

Virgil Harbert, Supt.
Lumberport, W. Va.

W. A. Godwin, Supt.
Water & Sewage
Huttonsville, W. Va.
and
D. M. Tyler
Water Supt.
Elkins, W. Va.

John F. Fussinger
Badger Meters
Cincinnati, O.
and
J. B. Quinlan
Chief Clerk
Water Dept.
Wheeling, W. Va.

Arthur Stroyd
Pittsbg.-Nat'l Meters
Pittsburgh, Pa.
and
Chas. W. Dermit
Penna Salt Co.
Pittsburgh, Pa.

Ben Hubley
Hersey Meters
Philadelphia, Pa.

J. W. Chapman, Supt.
Hurricane, W. Va.

V. J. Frezacca, Asst. Mgr., Logan, W. Va.

this method of keeping projected improvements on an even keel, so to speak, and making the best use of the taxpayers' money was the only method which could be considered as scientifically sound. He, of course, expected to argue for needed water supply improvements.

The report of the firm, Whitman, Requardt & Smith, of Baltimore, Md., had cost Cumberland about 75 cents per capita. The Commission had been sufficiently impressed to retain the same firm now to assist in working out the methods of financing the proposed improvements. All in Cumberland were thoroughly sold on the soundness of the decision to retain engineers in connection with the important basic program of post-war planning before actual blueprinting of those projects with highest ratings in respect to priority. Mr. Bruce felt that he couldn't overemphasize the importance of the engineering studies preliminary to choice of projects in their proper order of *overall* community importance.

Mr. Jordan pointed out the value of the State Water Coordinator and Sectional Coordinators in the Mutual Aid Program, with regard to their ability to make recommendations to the local water works operator as to his greatest needs in improving the local system. Such assistance might prove most helpful in developing post-war plans for water supply improvements to present to the local administration or planning group.

"Water Production as an Essential War Industry" was discussed by Major Frank W. Jones, U. S. P. H. S., Columbus, Ohio (on leave from Havens and Emerson, Engrs. of Cleveland).

Major Jones' principal theme was a plea to water works management to realize the high importance of the public water supply in wartime, the need for guarding against subversive actions and the possibility of supply failure through breakdown of equipment or inadequate supply source, storage, etc. He saw ahead the dangers of allowing maintenance to lag any further and pointed out the

E. F. Veader, Distr. Mgr., W. Va. Water Service Co., Charleston — *A. R. Todd, Supt. Filter, Wheeling, W. Va.* — *"Mike" Siebert, Neptune Meters, Richmond, Va.* — *J. S. Hugart, Engineer, Carbide & Carbon Corp., Institute, W. Va.* — *Thos. J. Blair, V.-P. & Gen. Mgr., W. Va. Water Service Co., Charleston*

greater availability of materials and equipment under the controlled materials plan of W. P. B. than in the early period of restrictions. Major Jones emphasized the fact that the Water Supply Division of W. P. B. was concerned over what may happen if more effective maintenance and replacements is not resumed by water operators and that W. P. B. will

Programmers

Lt. Col. Frank R. Shaw, Sr. Engr., U. S. P. H. S., Washington, D. C.

Perkins Boynton, Chemist & Supt. Filter, Clarksburg, W. Va.

Major Frank W. Jones, U.S.P.H.S. (O.C.D.), Cleveland, Ohio

see to it that requests and orders for immediate maintenance supplies will receive prompt approval; likewise, that anticipated needs will receive approval. At this juncture the highest duty of the water utility heads was that of insuring against even a temporary failure due to breakdown of supply or distribution facilities. In this category came the matter of planning for auxiliary supply in case of drought or other emergency. Seeing to it that there was ample reserve of purification facilities was, of course, as important as that of supply maintenance.

"The New U. S. Treasury Standards for Drinking Water" were analyzed and discussed by Lieut. Col. Frank R. Shaw, Sr. Sanitary Engr., U. S. P. H. S. Washington.

It was very apparent that Colonel Shaw came well versed in the new U. S. Drinking Water Standards because his highlighting of these standards was both inclusive and easily followed. He pointed out the major changes and improvements over the old Treasury (USPHS) Standards as (1) the inclusion of a Manual of Practices; (2) material increase in number of samplings required, such being based on population served by the particular water system; (3) the inclusion of the 100 ml. test portion for coliform organisms, which was still optional, and the 10 ml. portion remained acceptable although not as refined nor theoretically equivalent to the larger portion; (4) revision of permissible chemical constituents with some pronounced changes in this quarter; (5) a review of results from contamination due to cross connections and back syphonage; (6) some stated limits on bacterial quality of raw waters which may be expected to produce a safe water with assurance after specified treatments.

In his discussion, Col. Shaw felt that the Manual of Practice should be taken as an important part of the Standards. This because of its revelation of *potentialities*, while awaiting actualities revealed by laboratory findings represented waiting too long. He stressed the importance of evaluation of quality at the points of

Wm. Kirchman, Sup't, Filtration, Fairmont, W. Va. and "Art" Welch, Nuchar, Philadelphia — *Max K. Jones, Manager, Huntington Water Co., Huntington, W. Va. and Irving Thornburg, % Proportioneers %, Huntington, W. Va.* — *C. L. Stuart, Manager, Moundsville (W. Va.) Water Co. and O. H. Justus, Water Engineer, Vienna, W. Va.* — *District Managers "Al" Scheinert (Rensselaer) and Fred Durner (Mathieson), Pittsburgh, Pa.* — *State Dept. Health Sanitarians Rollie J. Neal, Sutton, W. Va. and Jas. H. Simmons, Weston, W. Va.*

consumption rather than from the main proper in the plant.

There was considerable discussion of the Standards in which it was pointed out that evidence failed to show a superiority for the 100 ml. test portions—in fact, the present evidence was that the 10 ml. portions revealed a higher concentration of coliform organisms. There had to be more evidence before the change could be considered justified, not to mention the greater cost and difficulties of handling the large portions.

A floor question to a State Health Dept. representative revealed that W. Va. was not ready yet to make the change in test portion size.

Harry E. Jordan was strong in his belief that the specifications and requirements as promulgated in the Manual of Practice needed to be carefully examined by engineers in the water supply field and further reviewed before its dictums could be accepted as thoroughly sound and practical. Through a review he thought perhaps a better balance could be struck in developing a workable Manual of Practice.

Col. Shaw agreed that judgment and discretion would be needed in connection with the Manual, but that it constituted a step in the right direction.

"Water Conservation" was the subject dealt with by Dan. E. Davis, The Chester Engrs., Pittsburgh, Pa.

Mr. Davis reviewed the methods available and measures to be taken checking distribution systems for important leaks and possible water stealing. Amongst these were the well known Pitometer Survey of the system and the taking of Pitometer records on large service lines assumedly inoperative except in case of fire on the premises of the customer. He also advocated use of the so-called Detector Meter on such lines. In many places indication of important leakage, waste or water stealing could be detected by observing the drop in elevated tank levels during hours after midnight. Another simple method is that of closing a valve and bypassing all water flow around the valve through a meter and back into the line. To reduce wastage, an educational campaign directed to consumers was, of course, the best procedure. He cited some phenomenal results just from such a conservation campaign, later supplemented with a leakage survey.

"Mapping the Distribution System" was the topic handled by J. B. Douglas, Engineer, West Va. Water Service Co., Charleston, W. Va.

There is a saying that the ease and clarity with which a speaker presents his topic is an indication of how well he knows his subject. If this be true, and likely it is, then Mr. Douglas can be rated an expert in the mapping of water distribution systems. We will make no pretext at doing justice to his paper, which will be printed in the A. W. W. A. Journal and no one interested in the subject should miss it.

Mr. Douglas' paper was designed to help the small system operator more than the larger operators, and therefore has an added value. It told of the basic requirements in mapping and the many advantages, amongst which the chief one was that of ability to locate valves promptly in case of accidents; its usefulness in main cleaning operations; locating leaks and bell joints without having so much paving break through; knowing the presence of insulating Dresser Couplings in main or service thawing operations; the availability of a true and historical record of underground values in rate controversies or valuation proceedings. Mr. Douglas then gave some hints to future mappers and exhibited a pocket size valve record book, explaining that exact valve location was obtained by the offset method from the curb line, after which a tape line can be used, in conjunction with the record book, to locate the valve.

Mr. Douglas also suggested that service line sketches in plan and profile, showing size, material, fittings and location of meter and type of meter box appear on each meter card.

Mr. Douglas cited cases wherein such maps of small systems had saved much time and cost in locating main leaks for repairs. Another case, where a cross was revealed in place of a bend on a main, saved the embarrassment of having a main cleaning machine hung up in the cross and having to dig for it.

"Trouble Shooting" was the title of a talk by Martin E. Flentje, Purification Engr., Am. Water Wks. and Elec. Co., New York, N. Y.

Like our friend, "Bill" Bailey, former Kansas City chemist and now Water Supt., brother Flentje started off by saying that the first rule in a complaint situation is to "Tell the Truth" to the customer. It will always pay in the long run.

One of the toughest problems is the control of the so-called bloodworms, which are really the reddish larvae of the chironomous or midgefly. Chlorine, copper nor lime had proved effective in infected reservoirs. The best remedy found had been a thin film of a light oil such as "Nujol" sprayed over the reservoir or tank surface with a spray gun.

In commenting on eel troubles, Mr. Flentje offered an ingenious idea. Chlorine had been applied just in front of the raw water intake entrance and this scheme effectively kept the eels away from the area. Other schemes had either not been effective or were not practical.

A hard water had been giving troubles from calcium carbonate deposits. The softening of a small fraction through a zeolite unit and mixing the softened and unsoftened fractions had corrected this trouble.

Manganese troubles had been the most prevalent in recent years and the most satisfactory method of its removal from well supplies of small systems remained a problem now under study. When precipitating manganese with high lime dosage to secure a pH of 9.5 or better, the water turns canned hominy brown. In laundries, peroxide black is being used where manganese is present because chlorine bleach just makes the stain browner, as would be expected. Manganese stains are removable with ammonium chloride—salamoniac to the trade.

"Testing for Residual Chlorine" constituted a lecture and demonstration of various test methods by Gilbert L. Kelso, Prin. Sanitarian, W. Va. State Dept. of Health, Charleston.

After discussing the merits and shortcomings of each method, Mr. Kelso demonstrated the Orthotolidin method and the various commercial test kits. Then he demonstrated the Neutral Starch Iodide Titration with standard thiosulphate solution and finally the more recent method developed in the Cincinnati laboratory of the U. S. Public Health Service. The method was published by Moore in the April 1943 A. W. W. A. Journal. It, too, is a colorimetric test which employs as an indicator an acetone saturated solution of para-aminodimethyl-analine-hydrochloride. In the presence of true residual chlorine, 5 drops of this reagent added to 50 c.c. of the water sample produces a pink color instantaneously. It is understood that manganese, iron, etc., does not interfere with the test and that it is very useful in detecting the true "break-point" in superchlorination.

"Coagulation of Water" constituted a lecture by Perkins Boynton, Chemist in Charge of Purification, Clarksburg Water Board, and a demonstration of jar tests in coagulation control by Mr. Boynton and Henry R. Gay, Asst. Chemist. Since Mr.

Boynton employed only a turbid but non-colored water in his demonstration, a member pointed out experiences with coagulation of a highly colored West Va. water in which break-point chlorination of the raw water had been effective in reducing the coagulant requirement from 10 gr./gal. to 2 gr./gal. at a pH value of 5.8 as optimum.

"The Chlorinator Clinic" was conducted by Earle P. Johnson, District Mgr., Wallace & Tiernan Co., Pittsburgh, Pa.

With the aid of flow diagrams in color, Mr. Johnson lectured on chlorinator performance and proper operation and care of two of the most widely used types of chlorinators. Amongst other things, Mr. Johnson said that the most common cause of chlorinator failure was the incorrect replacement of gaskets and getting the injector throat inverted in reassembly by operators. With the aid of the diagrams supplied all in attendance, Mr. Johnson revealed how this difficulty can be avoided. Perhaps the most common operating difficulty is the formation of chlorine hydrate (chlorine ice) under the bell-jar, caused by the spitting of re-liquefied chlorine into the jar when the chlorinator water supply becomes colder than the chlorine cylinder or gas line. Mr. Johnson said that just moderate warming of only the water feeding the tray of the machine would stop the troublesome chlorine ice formation.

Another troublesome deposit within the bell jar and in the injector is manganese and iron when present in the water supply. To correct this situation, some operators had inserted a small chemical feed pot in the tray supply line and fed "Calgon," which prevents precipitation of iron or manganese.

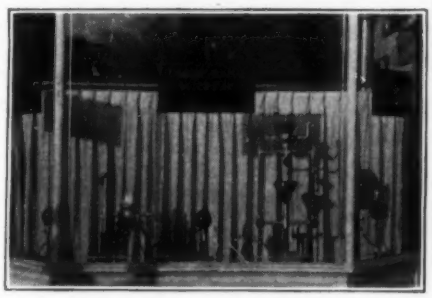
Harry Jordan, A.W.W.A.'s Executive Sec'y; Section Chairman H. W. Speiden, W. G. Yates, Const. Engr., Wheeling Water Dept., and Hayes Kuhns, Leadite Co., Kilbuck, O. (Note: At the moment Mr. Yates is in the process of signing on the dotted line, and Hayes Kuhns had sold another membership in A.W.W.A.)

Because of lateness of the hour and coming at the end of the meeting, Mr. Johnson's lecture and demonstration was unfortunately materially curtailed.

Inspection Trip and Annual Dinner

This report would be incomplete without mention of the inspection trip to Clarksburg's spic and span pumping station and softening plant which employs the zeolite process to produce a year round water of uniform hardness from a raw water which varies several hundred per cent in hardness and iron content due to mine drainage and extremes in run-off, as explained by Manager Highland early in the meeting.

Wm. Kirchman, Supt. Filter, Fairmont, W. Va. — *"Steve" Davis, Manager Water Works, McMechen, W. V.* — *W. G. Yates, Constr. Engr. Water Dept. Wheeling* — *"Art" Welch, Distr. Mgr. Ind. Chem. Sales, Phila., Pa.* — *A. L. Rhoads, Manager Water Co. Bluefield, W. Va.*



"Window Dressing"

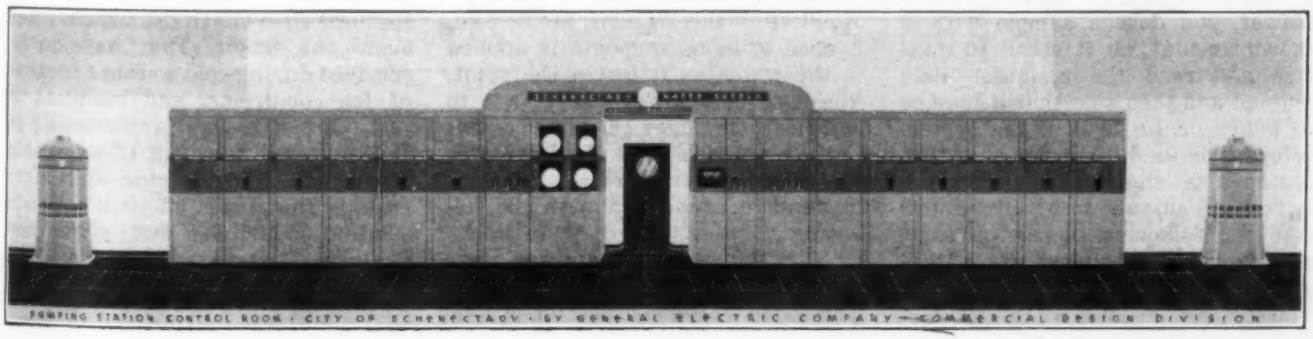
Educational Display of Clarksburg Water Board

After the inspection came the Annual Dinner, which featured Clarksburg amateur musicians in a pleasing recital and a Clarksburg haberdasher who out-magicianed some of the best magicians on the professional stage. The entertainment rated high, as did the performance of Clarksburg's Joe M. Low as master of ceremonies.

New Pumping Station Control Room in Schenectady by "G.E."

The Commercial Design Division of the General Electric Co. of Schenectady takes some pride in its design of the new main control room in the water pumping station of the city of Schenectady, recently completed. The 16-section metal-enclosed 2300-volt industrial control board consists of a water temperature and volume gage section, two incoming oil circuit breaker bus-tie sections, two auxiliary light and power distribution sections, ten standard 2300-volt, full-voltage, oil-immersed motor starters, indirect lighting provided by fluorescent lamps running the entire length of control board.

At each end of the control board is a 300-HP, 2300-volt, 3-phase, 60-cycle vertical squirrel-cage induction motor, driving a Layne deep-well centrifugal pump. Eight similar motors and pumps are installed in nearby houses. All are operated from the control board.



PUMPING STATION CONTROL ROOM · CITY OF SCHENECTADY · BY GENERAL ELECTRIC COMPANY — COMMERCIAL DESIGN DIVISION

WHAT'S YOUR CHLORINE DEMAND?

*A "Dear Bill" Letter**

From R. G. YAXLEY
Sup't of Water
WATERFORD, N. Y.

Dear Jim:

You remember that I wrote you some time ago about Pete using high pre chlorine doses and especially that he was sending high residuals out to the consumers. Well, he is still at it. As I mentioned before Pete was using pre chlorine for taste and odor control, and doing a good job on that soft, colored, river water with its load of sulphite paper mill wastes. And, there was another reason that Pete never talked about very much and that was those worrisome after-growths in the distribution system.

You know that his plant pumps directly into the system, the excess going into steel storage. Every year, in midsummer when the water got warm confirmed coli would show up in the distribution system where the circulation was not active, in spite of the high residuals (4 P.P.M. at times), leaving the plant. Some engineers take the stand that these after-growths are without significance, but Pete feels that coli is coli wherever you find it and that the consumer on the far side of town is entitled to sterile water just as much as the fellow beside the plant. You remember that with 4 P.P.M. leaving the plant only a trace remained a couple of hours away. Pete used to think that perhaps slimes, etc., in the old system, most of it being over fifty years old, was consuming the chlorine but after hitting it with big doses for several years he started in doing some heavy thinking. Well here is what he sprung on me the other day.

What's Your Chlorine Demand?

"What is the chlorine demand of a given water, how do you determine it?" Of course I bit with the stock answer, you dose a sample with a known amount, let it stand 10 minutes and read the residual. Pete grunted and then said that it may be 10 hours or 10 days in the system before it is used. Are you sure that you have satisfied all of the demand in your 10 minute test? He handed over the following memo. on some tests he ran last summer using stopper bottles stored in the dark for 30 hours.

**This folksy method of telling a story in an open letter from one "Super" to another was conceived and inaugurated by D. R. ("Doc") Taylor, then Supt. at Roanoke, Va., and now Captain of Engineers, U. S. Army. "Doc's" known and unknown readers were addressed as "Dear Bill"—but, what's in a name? Regardless of the salutation these letters represent an interesting and non-laborious method of telling the other fellow what one is doing or of some experience. We like them and, more important, our readers do—so, we invite you, Mr. Reader, to join in this innovation of "Doc" Taylor's. Send in YOUR "Dear Bill" letter as a fair exchange of ideas.—L. H. E.*

P. S.—We forgot to say that "Bob" of this letter is really "Pete" using a nom de plume. And, that is to say that "Pete" is no other than our friend from Waterford.

DOSE	RESIDUAL
16 P.P.M.	Trace
24 P.P.M.	.35 P.P.M.
32 P.P.M.	.50 P.P.M.
40 P.P.M.	.75 P.P.M.
60 P.P.M.	2.50 P.P.M.
80 P.P.M.	7.50 P.P.M.
100 P.P.M.	10.00 P.P.M.

Now if 16 P.P.M. left a trace after 30 hours why was 90 parts used up out of the 100 in the same time. Incidentally the 10 minute demand was only about 5 P.P.M.

This last season Pete really went to town. He takes hourly residual readings of plant effluent and during the month of August the lowest recorded reading was 3 P.P.M. On every other day it was 5 P.P.M. or more and on three days it actually reached 7 P.P.M., with not a sign of chlorine taste or odor, hot or cold. A dose of aqua ammonia is applied to the water as it leaves the plant, this dose being regulated to a 1 to 3 ratio to the free chlorine present in the clear well. The plant operates from 6 to 7 hours per day, bear this in mind in connection with the following.

With the above dose there were eleven mornings when no residual was found in the distribution system within two blocks of the plant and the highest reading was .15 P.P.M. This was of course before plant started. When starting the plant in the morning it was sometimes necessary to feed over 1¾ P.P.M. of post chlorine to the water being pumped into the system to get the required residual, in spite of the fact that the water in the clear well had received a pre chlorine dose of 11 P.P.M. the day before.

Importance of Time Factor

Pete thinks that it is a waste of breath to mention chlorine demand unless the time factor is included, and that this same time factor is responsible for those lost residuals in the system. Incidentally this was the first summer that no presumptives were found in system samples, even the agar plates were all zero. Pete feels that he has the troublesome after-growth problem licked. Now he is wondering just how much chlorine the ultimate consumer can stand as long as he doesn't know what he is getting.

The only kicks received were a few complaints regarding dirty water. Apparently the high residuals reached the house plumbing and killed off some pipe moss as the system water was in good condition at all times.

"Electric Painting" Doing a Job

You remember that Pete's board had him install one of those electric rust prevention outfits in one of his steel standpipes about three years ago. Pete says that it seems to be doing the trick, as internal pitting appears to have stopped. At least corrosion is nowhere near as bad as it used to be. The outfit had stainless steel electrodes which lasted about one season. They have to be removed during cold weather because of ice conditions, and stainless is just out because of war demands; so Pete got some worn out 1" wire cable from a local contractor and after cooking the grease off with hot soda solution he installed that; works just as good, lasts as long, and costs nothing.

"Bob."

"DISTRIBUTION-DEPRECIATION"

With Emphasis on the Need for Measures to Minimize Water Quality Depreciation Within the Distribution System

By MARSDEN C. SMITH
Chief Engineer
DEPARTMENT OF PUBLIC UTILITIES
RICHMOND, VIRGINIA

The Author

FREQUENTLY it pays to stop and look back over the road which we have traveled; for, then, we can often see important landmarks that were hardly visible or the relative importance of which was not recognized when passing. In recounting some past experiences in this article, the writer begs that you will not consider him boastful when pointing out the details of some of these landmarks.

After many years as an electrical engineer, the writer found himself, unexpectedly, in charge of a water purification plant. It so happened that just at that time there were committees in both the American Water Works Association and the American Society of Civil Engineers which were feverishly studying, and by the use of elaborate apparatus, trying to determine the ideal size, depth and uniformity for filter sands.

Accepting appointment to two of these committees, I undertook the work with the enthusiasm of a new religious convert. But I soon found it futile to try to filter water at anywhere near the "rapid-sand" rate unless and until the applied water had been properly treated. I then became certain that filters would be no problem if the water passing through them had been properly prepared for filtration, so as to introduce onto the sand beds a water of reasonably uniform qualities.

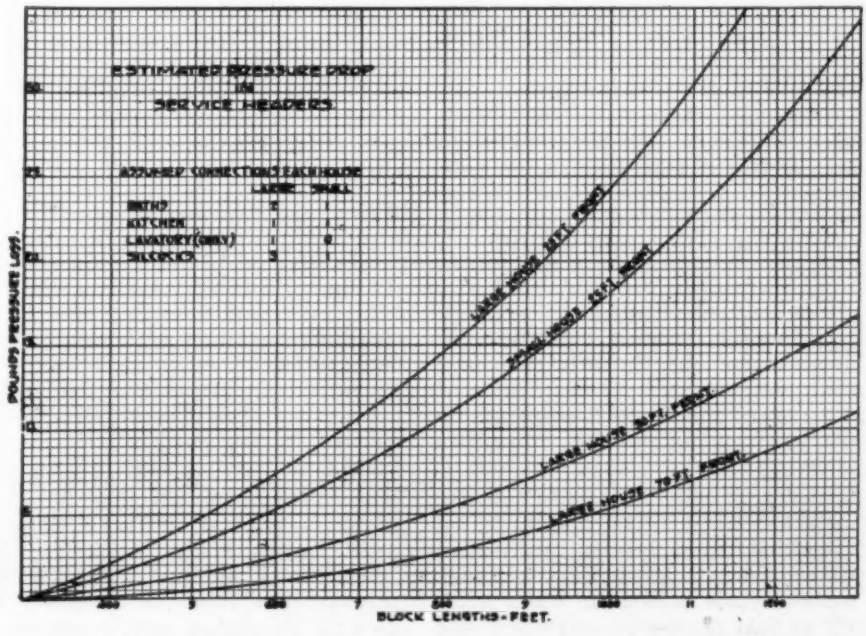
Because of this conviction, I, with many others having the same idea, laid aside the study of *sands* and directed our efforts to the real problem of *water preparation* for filtration. But when we now look back and realize that since that time pH control, activated carbon, two-chemical coagulation, mechanical flocculation, super-chlorination (sometimes "Break-Point"), and anti-corrosion post treatments have all been introduced or evaluated, we are truly amazed at what has been accomplished.

Why Ground Gained Only To Be Lost Later?

Yes, we may well be amazed, for all this represents a truly marvelous advance in the science of water purification. But we seldom realize how often the improvements from this progress in the art is confined almost entirely to the treatment plant. This is because no matter how good the plant effluent may be, unless it is kept good until used by the consumer, no one is benefited and all our improved treatments may become nothing but added trouble and expense.

Let us consider three samples of water: one, the polluted, dirty river raw water; the second, the sparkling, pure plant effluent; and the third, the mal-odorous, sickening, reddish brown water drawn from a tap in what is so appropriately known as a "Dead-End" area. To me, this startling comparison is the best way to force a realization of what I have termed "Distribution-Depreciation." This is because all water delivered to consumers must pass through the distribution system, and hence there can be no question that, today, "distribution-depreciation" is probably the most important problem now demanding solution. Otherwise, we will continue to produce a highly refined product at the plant, only to see it suffer depreciation or degradation enroute to the consumer.

Geography and a bad raw water caused "distribution-depreciation" to be painfully evident in the Richmond system. Because of this, for several years routine samples have been taken from a number of points on the distribution system and have been carefully analyzed in the laboratory. In addition, cast iron observation pieces have been inserted in the mains at points near the sampling stations, but, unfortunately, these studies have been interrupted by the war. This interest in "distribution-depreciation" attracted the attention of certain of the authors of the new Treasury Department Standards for Drinking Water, and was to that extent instrumental in turning the searchlight of investigation on what is happening between



Curves Used in Forecasting Pressure Losses Through 3 In. Cement Lined C.I. "Service Header" Lines for Residential Areas.

the treatment plant and the consumer.

The Problem is Far from Simple

Unfortunately, there seems to be no simple answer to the problems created by "distribution-depreciation." Of course, the more persistent residual chlorine in the distribution system, obtained by the use of the combination of ammonia and chlorine, and modern anti-corrosion treatments are a step in the right direction and are a real help when properly used. But apparently none of these provide more than a temporary protection, and appear wholly effective in only a limited part of the system. Consequently, until researchers have accepted the challenge and have found an overall effective method for the prevention of "distribution-depreciation," we must realize that causing the water to reach the most remote consumer *as soon as possible* after passing the nearest consumer is and probably will always remain an *extremely* important factor. Especially is this consideration important during the warmer months of the year.

This is rather unfortunate, because its accomplishment necessitates fewer and smaller reservoirs, tanks and mains. Of course, even the most fanatic water quality enthusiast would not think of endangering the fire protection or cause excessive pressure variations in order to speed up this delivery. But surely there are many ways in which engineers can accomplish a considerable improvement in the delivered water quality and yet not lessen the effective capacity of the system. As, for example, there are already being used by modern and alert engineers anti-corrosion pipe linings, or non-metallic pipe, and effective circulation designed to prevent stagnation in reservoirs, tanks and distribution systems.

But there are many engineers who will greatly increase "distribution-depreciation" by the arbitrary rule that no pipe shall be less than of 6 in. size, and there are some who will even use not less than 8 in. pipes anywhere in the system. Certainly, considering only "distribution-depreciation," such a decision must be seriously harmful because stagnation developing in unnecessarily large mains is just as fatal to water quality as that developing anywhere else in the system; perhaps even more so. But by the use of what we in Richmond call the "Service-Header," we can materially reduce this depreciation without reducing the efficiency of the system capacity.

The "Service-Header"

Perhaps we can best define a "service-header" by a description. We have all had "feeders" used to supply a large area and "mains" to distribute within these large areas and, finally, "services" to supply the individual premises. But there are many pipes that must be placed in a system that are neither, strictly speaking, "mains" nor "services." These are the pipes that are used to supply water service to one or more water consuming premises, but which has no other significance in the distribution system and consequently would not be installed unless required to supply these outlying premises. In contrast, with us a "main" is a pipe (6 in. or larger) used not only to supply abutting premises but to transmit water beyond, and also to provide fire protection in the area served.

While not limited by definition to use in residential areas, "service-headers" are rarely advisable or justified in other areas through which the water passes more rapidly. An example of one exception is on wide and heavily paved streets where a "main" is on one side and a "service-header" on the opposite side for the purpose of lessening the cost of running services. But since it is in the residential areas on the outskirts of the system that "distribution-depreciation" has reached its progressive worst, these "service-headers," such as installed in the Richmond system, actually do reduce depreciation of water quality to an important extent.

What Size "Service-Header"?

The limit of the size of pipe used for the "service-header" will, of course, be determined by the local conditions, such as water demand in each home, lot widths, distance between supply mains and the maximum permissible pressure drop to be allowed in the header. Of course, there is no possible exact determination of the maximum demand of a group of water consumers supplied by a "service-header." But we may determine a maximum demand or pressure loss that can rationally be used in the design, which maximum we know will not occur sufficiently often to justify increasing the investment in header size in order to supply such infrequently occurring maximum demands.

Naturally the lower cost of the "service-header," as contrasted to a 6 or 8 in. main, is added reason for its use.

The curves for a service-header of 3 in. cement lined cast-iron pipe are here given as an example of such a design. No pressure complaints have been received when the design has been determined by these curves, indicating them to be at least conservative. The 3 in. "service-header" is assumed to be supplied at both ends and the abscissa BLOCK LENGTHS include not only the width of the lot but an allowance of 65 ft. for the end-street widths, actually making the "BLOCK LENGTHS" on the diagram the distance between the supplying mains.

Curves are given for so-called large houses on lots of different widths. The curve for small houses is provided merely for comparison. Since modern residences having two baths and a lavatory (toilet and basin but no bath) are usually built on lots of not less than 50 ft. fronts and small houses on lots having not less than 25 ft. frontage, the curves have been found to be generally applicable and safely conservative.

In conclusion, I wish to again emphasize that we all ought to realize that more attention should be given to "distribution-depreciation."

Practices of the Future

We should realize that chemical treatment defense is now limited to anti-corrosion control of the finished water and maintaining a chlorine residual as far into the distribution system as practicable. In order to extend the area of good water or the time during which it remains good, it is probable that we shall soon see chlorine added at various points in the distribution system to make it practicable to maintain a residual throughout the entire system.

And that the design defense against "distribution - depreciation" is to avoid unnecessary stagnation and degradation of water quality, either in storage or the distribution system, and to protect the interior of ferrous pipes or tanks with any of several successful methods or linings, this protection being particularly effective in the areas where the water use is small and the movement slow.

MAINE WATER UTILITIES ASSN. HOLDS 15TH ANNUAL MEETING

ANNUAL meetings of most organizations have some feature toward which its members look forward. In the Maine Water Utilities Association, the annual clam chowder supper as guests of the Portland Water District is the lode-

Presiding

Fred J. Reny
Gen'l Mgr.
Portland, Me.
(No. 1 Host)

Allan F. McAlary
Sup't
Rockland, Me.
(Vice-Pres.)

stone that draws "a goodly crowd." Clam chowder the like of which is unknown outside the boundaries of the P. W. D. is the "Piece de resistance" but one must admit that the doughnuts, too, have a particularly delightful appeal.

Cooked and served by the members of the Portland Water District staff, this annual supper has become famous, even outside of Maine, as far south as this reporter's office, and this year 166 persons partook of its delectable menu.

With Fred J. (Joe) Reny, Gen. Mgr. of the Portland Water District, as host, and papers by Harry U. Fuller and Harold B. Scales, Chief Engineer and Chemist respectively of the District, the evening offered food for thought as well as the appetite. In the absence of the usual mountaineer musical ensemble, most of which is now marching to G. I. rhythm, the guests were amused and richly entertained by the Highland Mountain Woodchucks, a group of five boys who showed considerable enthusiasm as well as musical ability on a variety of instruments, including the well known wash board.

Submarine Pipe Repairs

Harry U. Fuller, Chief Engr. of the Portland Water Dist., presented a paper describing the problem of removing 500 feet of subm rine pipe and replacing it with new pipe laid in a deeper trench.

The work involved a one and one half mile pipeline from Portland to an island in the harbor, the line being 8-inches in diameter and laid in four feet of clay beneath 18 feet of water. As originally laid the pipe showed no leakage for four years, but then began to develop frequent leaks requiring considerable attention.

A decision of the Army Engineers to deepen the channel to a depth of 22 feet for a width of 450 feet gave

Mourned

Horace J. Cook
(Late Wheelhorse Chairman of M.W.O.A.'s Important Wartime Practices Committee and Others)

ample reason to lay new pipe inasmuch as the new channel depth would be below the top of the old pipe. The problems involved included uncovering and removing 500 feet of the old pipe and trenching, laying, and covering the new pipe as well as connecting the old sections.

To uncover the old pipe a 12 ft. "snow" plow of heavy oak was made and pulled along the pipe line overlay by power boats. This method

M.W.U.A. "Prime Movers"

Earle A. Tarr
Sup't
Winthrop, Me.
(Sec'y-Treas.)

Sidney S. Anthony
Sup't
Augusta, Me.
(Editor-Director)

worked exceptionally well in the type of soil encountered. The new trench was dug by a water jet using 500 g.p.m. and the soft clay was removed from the trench during the jetting by a home-made "mud hog" air lift pump using 350 c.f.m. of air. The discharge from the air lift pump was several feet to one side of the trench. Barring mechanical difficulties the trenching was accomplished at the rate of 30 ft. per hr. producing a trench three feet wide and five feet deep. [This novel device will be described in an article being especially prepared for WATER WORKS AND SEWERAGE by Mr. Fuller. It would appear to have many applications in sewage as well as water plants. —Ed.]

The new section of main consisted of screwed joint pipe, which was made up in one section on the beach. Each joint was protected with a 10-in. sleeve long enough to completely cover the joint and allow room for caulking. At low tide the pipe was rolled to the water's edge,

Esty Speaking

And, as a member of the National Committee on Water and Sewage Works Development, doing a typical Esty job of expounding the advantages of the "Blueprint Now!" movement in the water and sewage field—in short, doing a job of post-war "Estymating."

where it was picked up by lighters at high tide.

With both ends plugged and barrels spaced to increase the buoyancy, the 500 ft. section was "floated" by three lighters to the trench. The ends which overlapped the old pipe were marked by a diver, raised and cut off, then lowered for joining to the old pipe by split sleeves. Backfilling of the sub-aqueous trench was accomplished by dragging a 30-ft. rail up and down the length of the trench.

Observations on Calgon

According to Harold B. Scales, Chemist of the Portland Water Dist., some of the submarine water lines from Portland to army bases on island are the deepest in the world, being at least 150 ft. below water surface in places. When these lines, which vary in size, were laid, they were sterilized with 50 p.p.m. of chlorine. Inasmuch as these pipes were uncoated wrought iron, the designing engineers, Metcalf and Eddy, recommended the regular use of sodium hexa-meta-phosphate to prevent corrosion.

At the present time, beyond the fact that red water trouble has not been experienced, it is not possible to ascertain the effectiveness of this treatment. Mr. Scales, however, has made some observations on the handling of the hexa-metaphosphate solution. The material is corrosive in high concentrations, and promotes the growth of bacteria in stock solutions. The bacterial growth, however, may be offset or prevented by the addition of 1 p.p.m. of chlorine to the stock solution. Mr. Scales closed with the comment that he expected the lines to corrode from the outside effects of sea water rather than from any failure caused by internal corrosion.

Hosts

(Left to right)

Harry U. Fuller, Chief Engineer

Harold B. Scales, Chief Chemist

Everett O. Boothby, Ass't Sup't Portland Water District

Guest Speakers

Roger W. Esty
Sup't
Water & Sewage
Danvers, Mass.

Arthur E. Gorman
Chief, Water Div.
W.P.B.
Washington

Business Session

During the business session on Wednesday morning, presided over by A. F. McAlary, Supt. of the Rockland-Camden Water District, the Secretary and Chairman of the Defense Committee, Sidney Anthony, Supt. of Water, Augusta, told of the new U-1 order and the release of copper tubing. Arthur Gorman, Director of the Water Division, OWU, explained the new U-1 order, particularly as regards the AA-1 and AA-3 priorities applicable in water utilities.

Mr. Gorman also explained the filing of form 2774 direct to Washington not to the field office. Sheet steel is still "tight" as are turbines and valves, but copper from one's own inventory is, of course, now available. Mr. Gorman asked that operators stop deferring of maintenance. There is now enough material for needed maintenance and it is a war service to keep plants in good operating condition.

Mr. James M. Caird of Troy, N. Y., called attention to the drop in Typhoid Fever Death Rate in the State of Maine. In 1900 water was considered O.K. when the typhoid death rate was 20 per hundred thousand population. The rates are shown in the accompanying table.

Years	Death rate per 100,000
1900-04	29
1905-09	19
1910-14	15.9
1925-29	4.1
1935-39	1.6
1940	0.5

The meeting voted to approve the resolutions of the AWWA of Jan. 1944 in regard to copper tubing, and the drinking water standards. (See *Water Works and Sewerage*, page 49, Feb. 1944.)

Technical Session

"Types of Hydrants" was the subject of a discussion led by F. J. Reny, Gen. Mgr., Portland Water Dist. Mr. Reny suggested that one type of hydrant be chosen and used as a standard, rather than have various types, sizes and heights. Asking but not answering the question "Why are hydrants broken?" Mr. Reny said their breakage was approximately one a month.

Mr. Reny also warned that if hydrants are not legally located, damage to a vehicle striking one may be

"Brass Hats"

President of the New England W. W. Ass'n Horace J. Clark, Supt., Sanford, Me.

Sec'y-Treas. of the New Hampshire W. W. Ass'n, Clarence E. Ferry, San. Engr., N. H. Dept. of Health

President of the New Hampshire W. W. Ass'n, George G. Bean, Supt., Exeter, N. H.

R. F. Ford
N. E. Mgr.
R. D. Wood Co.
Worcester

Percy Sanders
Sup't
Concord,
N. H.

Al W. Read
Sup't
Bangor,
Me.

Fred J. Gibbs
Distr. Mgr.
W. & T. Co.
Boston

Jas. A. Caird
Cons. Chemist
Troy,
N. Y.

"Steve" Taylor
Consultant
Bedford,
Mass.

Eben Lufkin
New Eng. Mgr.
Pbg.-Nat'l Meters
Boston

"Reggie" Hayes
N. E. Manager
Hydraulic Devel. Co.
W. Bedford, Mass.
and
Chas. S. Brewster
Supt.
Dexter (Me.) Water Co.

York Water District
Delegation
Sam'l H. Junkins
*Gilman L. Moulton**
Roger K. Lucas
Arthur W. Norton
Trustees
*(*Chm'n of the Board)*

John C. Finn
U. S. Pipe
Boston
and
Jos. V. Fitzsimmons
Kennedy Valves & Hydrants
Boston

assessed against the utility. Others present said that the presence of fire dept. or city officials at the placing of fire hydrants automatically made the hydrants legally located. Camden had the legislature pass an act legally locating all of the hydrants in that community.

In Augusta after a heavy snow storm the water department, through the newspaper, enlisted the aid of the public to shovel out the hydrants. The plea was successful. In regard to keeping hydrants from freezing, one man said the use of rock salt should be avoided as it caused corrosion of the stem.

Blueprint Now!

Speaking for the Committee for Water Works and Sewerage Development in splendid fashion, Roger Esty, Supt. of Water and Sewerage, Danvers, Mass., brought to the meeting the history, purpose and activity of the *Blueprint Now* program. Among the things which a utility can do now is to list needs in the order of their importance, prepare plans, consider the details of financing, reappraise the authority under which the work is to be done, and purchase lands and right of way.

As examples of works that could be planned Mr. Esty suggested sewerage as a No. 1 job in many communities, replacement of meter boxes, installation of proper size mains, revisions of filter plants and many others.

More M.W.U.A. "Manpower"

Jo. W. Randlett
Supt.
Richmond, Me.
(Chairman of the Program Com.)

Maurice Libby
Supt.
Bath, Me.
(Keeper of the Lantern)

Another thing Mr. Esty emphasized is the obligation utilities have to accept their share of returning soldiers, including wounded veterans. What can be done in this regard was indicated by the story of one plant where a soldier who had lost his sight had been trained to be a meter repair man. The training of sightless or otherwise disabled soldiers by the army rehabilitation hospitals will fit many of them for work in utility plants.

Mr. Esty also told the story of one of his own men who had become a water plant operator in Alaska. The training this man has received will be worth a great deal to him and to the water department to which he will return.

As to the matter of financing post war plans, it was pointed out that in Maine a state law makes it possible for a utility to set aside five per cent of its revenue to be used for post war planning, and plans.

Mr. J. E. Hale, Acting Chief Engr. of the Maine Dept. of Health, had made a tabulation of projects needed in Maine, and the total of essential work required, not including deferred maintenance, is $21,000,000. At this rate, for the rest of the country, the amount of work to be done reaches far beyond any estimates previously made of $200,000,000 a year for ten years.

P.W.D.'s Spick and Span Store Room and a Corner in Its Well Equipped Meter Shop

Whitman, Requardt, and Smith, Engrs., Dissolve

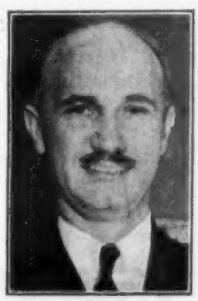
Announcement has been made of the dissolution of Whitman, Requardt, and Smith, Engineers, of Baltimore, Md., and Albany, N. Y. Mr. Whitman and Mr. Smith have formed a limited partnership to be known as Whitman and Smith, 11 N. Pearl St., Albany. Mr. Whitman and Mr. Requardt have formed a partnership to be known as Whitman, Requardt and Associates, 1304 St. Paul St., Baltimore, Md.

All engineering engagements of the former partnership of Whitman, Requardt, and Smith that have been performed through the Albany office will be continued by the firm of Whitman and Smith, and similarly, engineering engagements formerly performed through the Baltimore office will be continued by the firm of Whitman, Requardt, and Associates. Interchange of information and data between the two firms will continue as has been customary heretofore between the two offices.

Water and Sewage Chemist Made President of "Illini" Alumni

"Swede" (C. C.) Larson, Chemist in Charge of Sewage Treatment and Sup't of Water Purification at Springfield, Ill., has been elected president of the Univ. of Illinois Alumni Ass'n.

"Swede" was graduated in the class of 1918, obtained a Master's degree, worked for the Illinois State Water Survey and then for several years was chemist in the State Health Dep't Sanitary Engineering Laboratories.



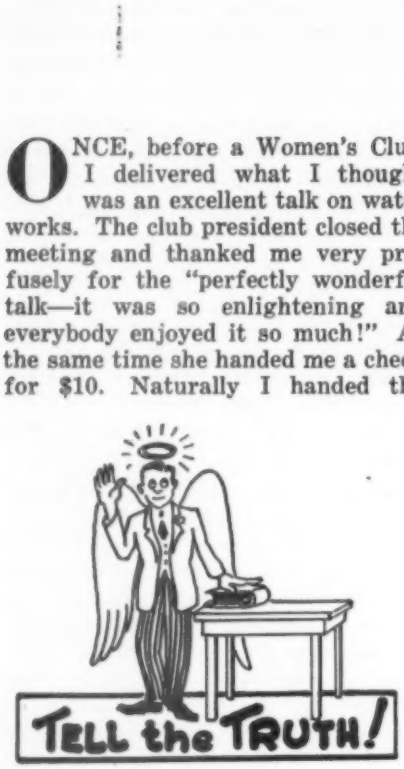
"The Swede"

"Swede" only recently was appointed to his position in the water field, but has long been prominent in sewage works activities and is past-president of the Central States Sewage Works Ass'n. As a leader of panel discussions he is a "past-master." And we might add that, as a violin player, the "Swede" rates the job of Concert Master of Springfield's Symphony Orchestra.

WHAT TO TELL THE COMPLAINING CONSUMER*

By WM. T. BAILEY
Superintendent
DEPARTMENT OF WATER
KANSAS CITY, MO.

ONCE, before a Women's Club, I delivered what I thought was an excellent talk on water works. The club president closed the meeting and thanked me very profusely for the "perfectly wonderful talk—it was so enlightening and everybody enjoyed it so much!" At the same time she handed me a check for $10. Naturally I handed the



Rule No. 1

check back with the explanation that it was my duty to appear before civic groups to explain the functioning of the Water Department whenever they desired and, therefore, I could not accept pay.

She said, "Oh, Mr. Bailey, that is

Rule No. 3

so kind of you. We will just put the money in our special fund."

I don't know why I did it, unless

*This article is based on an informal talk made before the Missouri Water and Sewage Conference, and written thereafter at the request of the editor of *Water Works and Sewerage*.

The Author

it was just to make conversation, but I stepped right into the next one by saying, "Well, that is very nice. And tell me, what is this special fund for?"

She replied, "Oh, it is used to secure better speakers."

The First Rule—Tell the Truth

This question of "What to Tell the Complaining Consumer?" should require but little discussion. The answer is obvious when one stops to consider that the consumer is the employer of the water works operator. Therefore, the consumer is entitled to the same treatment that the owner of the corner store is entitled to receive from his employes when he has a complaint to make to them. The question, "What to Tell the Complaining Consumer?" is completely answered by two words, THE TRUTH. And any water works superintendent who attempts to cover up mistakes or in any way take advantage of the consumer is certain to come to grief. I can cite incidents where water works superintendents have suffered "nervous breakdowns" as a result of facing the wrath of consumers whom they had deliberately misinformed.

When one stops to think of his own personal experience with public employes, elective and appointive, who take the attitude that they should tell the public "what the *public* can do," it is no wonder that there are times when entire administrations are swept out of office by indignant voters. When this does happen, you will almost invariably find that the courteous, conscientious and efficient man on the public payroll remains there.

A Complaint Deserves a Hearing

Getting back to the complaining consumer. When a person makes a complaint he is entitled to a hearing. The complaint may or may not be justified. Usually you will find that when the complaint is not justified,

Rule No. 2

it is the result of some real or fancied wrong suffered by the consumer at some past date. A friendly audience with the consumer will usually bring this out and give you the opportunity to make amends for the past mistreatment, fancied or real. You will probably have to listen to all their personal problems, but

Rule No. 4

(Last but not the least.)

doing this will give you an ally instead of antagonist in future dealings with the public. Should the complaint be justified, the consumer is entitled to a frank explanation, together with remedial action at the earliest possible moment. This is due the man in the shack across the

tracks as well as the president of the bank or the mayor of the town.

Complaints can generally be divided into one of two classes: Those related to quality and those related to service. The first group consists of complaints of taste, odor, red water, muddy water, the presence of such undesirable organisms as blood worms, etc. The second group consists of complaints of low pressure, high bills, and all those related problems such as turning on and off service, deciding who is to pay for repairing leaks, repairing meters, and the myriad of other related problems that a superintendent is called upon to arbitrate.

A Promise Is Something To Be Kept

Let us briefly consider those complaints of quality or lack of quality. Careful supervision and control of purification should, considering present-day knowledge, keep lapses in quality to a minimum. Should one occur, the only thing to tell the complaining consumer is the truth. Now, by telling the truth I do not mean that you should wisecrack, "Don't you know that there is a war on?" The consumer will resent any such attitude just as much as you would if you were in his place. The explanation should be straight-forward with no attempt to pass the buck to the war or to some subordinate in your organization. A good way to explain is to say, "We are very sorry that this happened. But, because of circumstance beyond our control (explain the circumstance), we were not able to handle this situation. Everything that can be done to remedy the condition is being done and we expect to have it under control very shortly. I only hope that you have not been caused too much inconvenience and discomfort. You may be assured that we will do everything we can to prevent this happening again." Or, "Thank you for calling this to our attention. We intend to take care of these things before they become objectionable. However, because of a shortage of help we just haven't been able to get to them as soon as we normally would. We will take care of this case at once and try to catch it before it becomes objectionable in the future." *Then see that you do just that.*

Personal Investigations Can Do Much

By all means, investigate and analyze the complaint even though it means a trip to the site of the trouble, collecting samples and even checking plumbing. In the event nothing is found wrong, do not enter into a dispute with the consumer. He will resent any inference that he does not know what he is talking about just as much as you would resent any such inference from your grocer when placing a complaint with him. The indicated answer is, "I am very sorry that you have been caused any inconvenience. There doesn't seem to be anything wrong just now so I am unable to correct the situation. If you will call again just as soon as you notice anything wrong I will either come out or send someone out to try to locate the source of trouble so that it can be corrected." Should another call come from that consumer, see that it is answered at the earliest possible moment. Should you find anything wrong, locate the source of the trouble and remedy it at once if your department is responsible. Or, in the event that the cause be found in the consumer's property, have him correct it.

Many surprising things are learned about your distribution system in this manner. And this is the only means I have found for curing the person who makes complaints in retaliation for some real or fancied wrong. As many as four or five trips have been made in answer to such nuisance calls before the consumer was sufficiently shamed to stop making them. And I have found pieces of old gas pipe in the water line, burned out furnace coils, and similar things responsible for complaints. These could by no stretch of the imagination be charged against the water department, but they would have been had the source of trouble not been located for the consumer.

Service Complaints

In general, complaints in regard to service are centered on the interpretation of department rules and policy. It must be kept in mind that where the department is municipally owned, these rules should protect the interest of the complaining consumer as well as the interest of all other consumers. The superintendent arbitrates between stockholders, as it were, and his interpretation of the rules should be based on the equities of all involved. The rules, if found wrong, should be corrected to make for fair treatment to all concerned. Your interpretation of borderline cases should be such that bad precedents are not established. Unless this is so, you may be frequently embarrased by finding that one consumer knows all about a decision rendered for some other consumer, and you are likely to find yourself becoming so involved that it may be difficult to extricate yourself.

One of the more frequent complaints in this group is that of high bills. This is apt to be more prevalent where water bills are rendered for two or more months' service and other utilities render their bills monthly than where all utilities bill for the same period. In such cases a courteous hearing, and producing the department records to show the consumer that the bill is for the longer period will usually suffice. The consumer should be given attention as soon as possible when he comes in to make his complaint and not be made to sit around waiting for some time, nor sent from one person to another. His indignation will mount with each minute he has to wait, or with each time he is transferred from one party to another, to the end that he may reach the point where it is impossible to reason with him.

The Leak Problem

Another source of high bills is plumbing leaks. The consumer should always be given courteous, prompt attention, and the billing records produced to show him that there actually was an increase in the metered amount of water. The probable sources of trouble should be explained to him, with the suggestion that he get a plumber at the earliest possible moment to go over his plumbing fixtures.

Questions such as who is to replace leaking services are sure to end in a certain number of complaints. In all events, the interpretation of your rules governing these matters should be absolutely fair with the consumer and all charges rendered him for service by the department should be scrutinized to see that they are in line. The consumer should be given prompt, courteous attention when complaints in these matters are made and the records produced and gone over with him so that he will understand what has taken place. Where an error is made, it should be rectified promptly and an apology made to the consumer.

Same Rules as in Other Business

One could elaborate for hours on this subject, but our time is limited and we must bring this discussion to a close. In closing I wish to emphasize that, in dealing with the complaining consumer, the same rules of public relations apply that apply to any other business.

First, your cashier and other persons meeting the public should be pleasant and smiling even though

they may not be exceptionally good-looking. It is said that but five muscles are used in smiling while twenty-one muscles are used in frowning. Therefore, it should be easy to smile unless a person has such a long dour face that five muscles do not have enough strength to pull such a face up into a smile. My personal reaction is that many utilities concentrate on getting people of this type in positions where they must deal with the public.

Second, you should always be courteous. Give the consumer an opportunity to tell his story. Frequently all that is required is an opportunity to get it out of his system. Remember that he is entitled to all the courtesy that you would give your boss and that you would expect from your subordinates.

Tell the truth—always. Don't hesitate to lay your cards on the table and admit your mistakes. Apologize for your mistakes and correct them immediately without any buck-passing. See that such mistakes are not repeated.

Third, be fair in the interpretation of your rules. Remember, the consumer is not as familiar with your procedures as you are; so always be ready to produce your records to show him just how your business is carried on. Be firm and businesslike in carrying out your decisions.

Fourth, always keep your promises. Above all, don't promise more than you can deliver.

Finally, try putting yourself in the consumer's place and see whether or not your story would satisfy you. If not, you had better buckle down to work and see if you can't come up with something better.

Acknowledgment: The sketches accompanying this paper were drawn by Harry Wheeler, Chief Draftsman of the Kansas City Water Department.

DRY WEATHER COMING

By HALBERT P. GILLETTE

AS stated in previous articles there is a series of powerful weather cycles, each of which is three times as long as the next shorter one. I call it the triple-progression series. The length of a cycle is the time interval between its maximum effects. One of the cycles of this series is 67 years long. It had its last cold-wet maximum in 1883, in most regions; but there were some localities where the phase was inverted, and a warm-dry maximum occurred. Its next cold-wet maximum will occur in 1950. One of its subcycles has a length of 1/9 of 67 or about 7.44 years, whose next warm-dry maximum will occur October 20, 1946. There is another subcycle whose length is about 2.48 years, whose next dry maximum will occur May 1, 1944. In recent weeks its drought effects have been felt in many regions, and will grow progressively worse until May 1, after which they will slowly lessen.

This last named cycle is nearly 30 months long. It has subcycles of about 10 months and about 3⅓ months, or, more exactly 100.7 days. And there are cycles of ⅓, 1/9 and 1/27 of 100.7 days. All cycles of this triple-progression series are harmonic; hence when a maximum effect of one of the longer cycles occurs then a maximum effect of all the shorter cycles in the series occurs. Hence by studying the effects of the shorter cycles in any given locality, the effects of a longer cycle can be foretold with considerable accuracy as to that locality.

Unfortunately these triple-progression cycles have "competitors" that at times are strong enough to override their effects. Each of the 9 largest planets (including Ceres) tends to cause a rainfall cycle whose maximum occurs when the planet is in longitude 289 degrees, viewed from the sun. The Earth is in that heliocentric longitude July 12. Six months later there is a dry maximum in many regions, but in some regions (notably our Pacific slope states) its phase is inverted, and the wettest period is usually in January.

The tracks of storms entering America from the Pacific tend to shift southward near rainfall cycles, notably the 22⅓, the 67 and the 201-year cycle. The converse occurs near rainfall minima. This is one of several causes of opposite phases of cycles in different latitudes. Failure to understand phase inversions has often led meteorologists to be skeptical even as to the eventual utility of cycles for forecasting purposes. While much remains to be discovered about phase inversions, enough has been learned to make it highly probable that this problem can be fully solved.

The shorter the cycle the greater is the difficulty of forecasting its effects in any given locality. Topographical conditions are a factor in the direction that storms travel, as well as in the amount of rainfall that a given air-whirl will produce. And there are other local differences that give complexity to the problem. One of these is, I believe, the existence of local magnetic poles in the earth's crust, the number of which is great, and the presence of which affects the number of electrons in the air near such poles. Electrons serve not only as nuclei for the condensation of atmospheric moisture, but they reflect some of the solar heat back into space. As a result of such reflection the underlying air becomes abnormally numerous. Carried to an extreme and, prolonged for centuries, this is, I believe, the cause of ice-ages.

The 201-year cycle and all its subcycles will cause a warm-dry maximum in January, 1984, but long before that event, the shorter cycles of the triple-progression series will produce increasingly severe droughts. In fact, they have been doing just that since the warm-dry maximum of the 67-year cycle in 1917. Beginning then the rings of pine trees in eastern Oregon became thinner than they had been in 650 years! This led me to infer that a cycle much longer than the 201-year cycle was at work. By studying rock strata in which varves (annual layers of sediment) exist, I found longer cycles in the triple-progression series, notably cycles of 603, 1809 and 5427 years. Varves measured in a core taken from the bed of an existing lake show that the 1809-year cycle had its last wet maximum in 1079 A. D. Hence its next dry maximum will occur in 1984. There is good evidence that the 5427-year cycle will also have a dry maximum in 1984.

[In a forthcoming booklet on "Cycles and Their Causes," which Mr. Gillette now has under production, some of the evidence as to these, as well as longer and shorter cycles, will be given. A copy of this 80-page booklet will be sent without charge to any reader of this magazine who will make a request for it. It will represent something of a digest of the more important articles that Mr. Gillette has published over the past several years as the result of his hobby studies of "Weather Cycles," and the possibilities of long range forecasting of precipitation expectancy and onset of drought periods. If you desire a copy of Mr. Gillette's forthcoming "Weather Cycles and Their Causes," place your request early.—L. H. E.]

NEW CENTRAL CONTROL AT MILWAUKEE SEWAGE TREATMENT PLANT

By

CHAS. G. RICHARDSON
Vice President
BUILDERS IRON FOUNDRY
PROVIDENCE, R. I.

and

JOSEPH A. MAIERS
Field Engineer
MILWAUKEE SEWERAGE COMM.
MILWAUKEE, WIS.

MOST persons, even engineers, would smile if it were suggested that there is anything romantic in the treatment of sewage; yet, some day, the romance of the Milwaukee Sewage Treatment Plant may well be written.

If ever there was pioneering in the interest of the public welfare, it is to be found here, beginning with the small structure for experiments in the activated sludge process erected on Jones Island some thirty years ago, followed by the bold planning and building of a huge plant to produce marketable fertilizer, all under the adventuresome leadership of the late T. Chalkley Hatton. Little equipment was available in those days and, among the many problems, that of drying the sludge was especially formidable.

Somehow, the early pioneering spirit has continued at this plant to the present day. Frequently the plant is found "out ahead" in trying new methods and improved apparatus. Sanitary engineers often seek advice here when they encounter difficult situations or are studying changes in their own plants.

An example of recent progress at Milwaukee is in the installation of a new central control system to facilitate closer proportioning of the return sludge to the raw sewage.

The Problem

The 1942 average suspended solids content of the raw sewage, after passing through the coarse screens, the grit settling channels, and the fine screens, was 300 ppm. The return sludge averages 1.7 per cent and the mixed liquor 0.37 per cent. It is very essential to mix the return sludge and raw sewage in the proper ratio, roughly 5 to 1 (varying with the solids content of the return sludge) so as to maintain continuously the desired concentration of solids in the mixed liquor as specified by the plant laboratory.

In the activated sludge process there is an intimate relation between the volume of air required, the period of aeration, and the proportion of sludge fed to the raw sewage.

After the East Plant was added in 1935, the problem became more involved since it is essential to maintain identical quality of the mixed liquor in either, or both, West and East Plants.

[An aerial view of the 155 mgd. Milwaukee Treatment Works, with the newer East Plant in the foreground, appears on the cover of this issue.—Ed.]

Previous Methods

Referring to Fig. 1, the raw sewage flow is from fine screen house "S" to mixing chambers "MW" and "ME" leading, respectively, to the

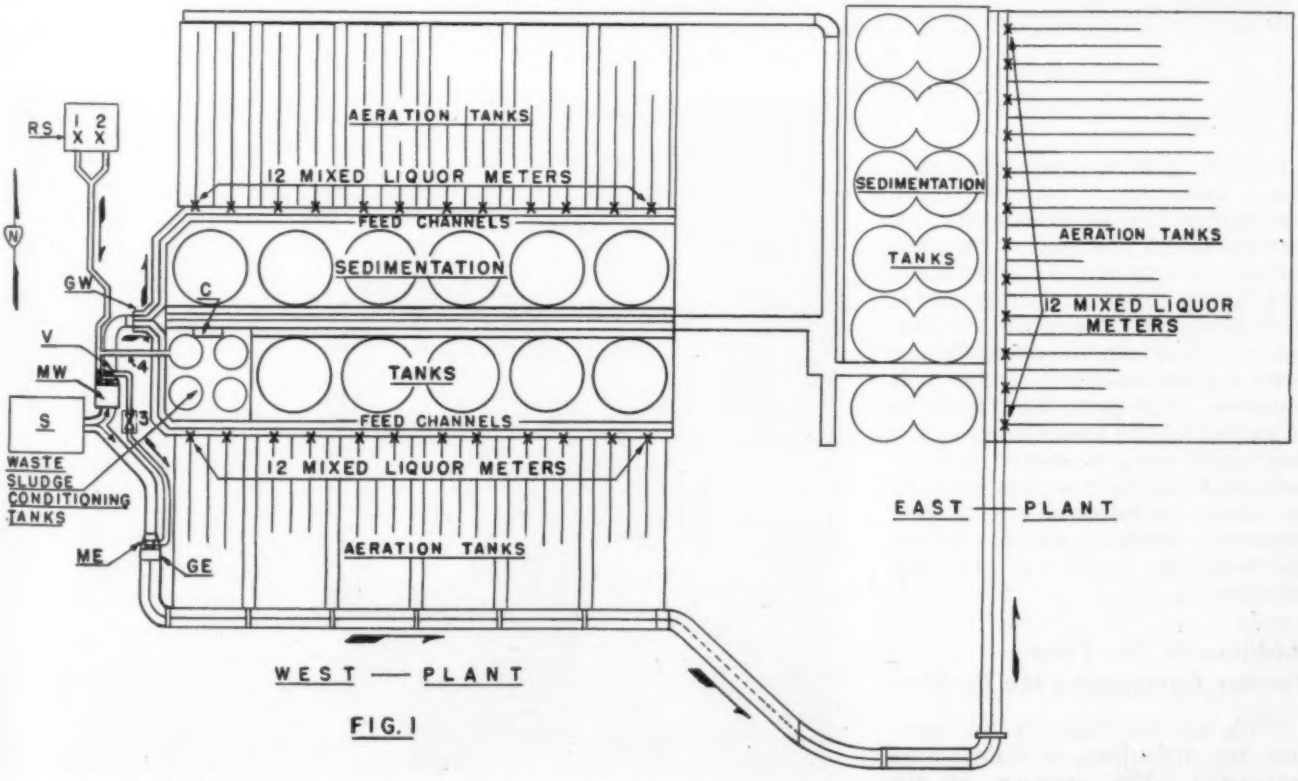


Fig. 1. Layout of Milwaukee Sewage Treatment Plant Showing West Plant and East Plant and Location of Metering Devices

West and East Plants where the return sludge is introduced, forming the mixed liquor. The latter then passes through control gates "GW" and "GE." At these points, the operator can split the mixed liquor flow to the West and East Plants as desired by positioning the gates. At present, control gates "GW" for the West Plant, located a short distance from the central control room "C," are kept fully open at all times and the control of flow to both plants is accomplished through gates "GE."

Even when the West Plant alone was in operation, adequate proportioning was not as simple as might appear at first. To obtain the rate of incoming raw sewage it was necessary to read the rates of twenty-four individual 24-in. Venturi meters measuring the flow of mixed liquor to the aeration tanks, totalize these rates, then deduct the reading of return sludge flow. This required a ⅓-mile walk by the operator, in addition to making valve readjustments. The readings could not be taken, and gates reset, oftener than once every two hours. The following table, typical of the daily pattern, shows the yearly average Monday flow rates for 1932 and 1942; it well illustrates the difficulties of close proportioning:

Hour	Rate Million Gals Per Day 1932	1942
2 am	55.5	90.0
4 am	49.4	80.0
6 am	46.3	75.0
8 am	55.5	90.0
10 am	92.5	150.0
12 noon	98.7	160.0
2 pm	105.0	170.0
4 pm	98.7	160.0
6 pm	95.6	155.0
8 pm	92.5	150.0
10 pm	80.2	130.0
12 midnight	71.0	150.0

Observe that the minimum rate at 6 a. m. is only 44 per cent of the maximum at 2 p. m.; also, at 8 a. m. the flow is 60 per cent of the rate only two hours later. While the operator, with increasing experience, could "level out" the mixing process to a certain extent, one can easily imagine a losing struggle in the main endeavor. It became the practice to be guided by the past average daily flow tables, using the meter readings only as a check, to accurately vary the return sludge from one to four times in a two-hour period. To say the least, the result was not very satisfactory.

Addition of New Plant Further Complicates the Problem

With the East Plant also in operation, the difficulties, as stated, were intensified. For example, if the actual flow of raw sewage to the East Plant is 45 per cent and to the West Plant 55 per cent of the total, the return sludge should be similarly proportioned to the two mixing chambers. Assume, however, that with the rapidly increasing rate of raw sewage flow the operator, even with frequent readjustments of the east gate, has been unable to obtain a ratio of mixed liquor distribution closer than 40/60. This produces a rise of solids concentration in the East Plant and a corresponding reduction in the West Plant.

While the operators did as good a job, under these difficulties, as could be expected, as indicated by the averages over a period of time, such averages do not show the extent of the fluctuations. If the readings were off in one direction, the operator would immediately reverse the ratio: a sort of human, instead of a mechanical, "hunting action."

When the East Plant was built, additional return sludge pumping capacity was added at station "RS," also a second Venturi meter. These two meters, No. 1 and No. 2 (Fig. 1) measure the output of the pumps before the sludge enters a common main, from which two branch lines containing valves "V" lead to the two mixing chambers. Another Venturi (No. 3) meters the sludge to the East Plant only. The procedure

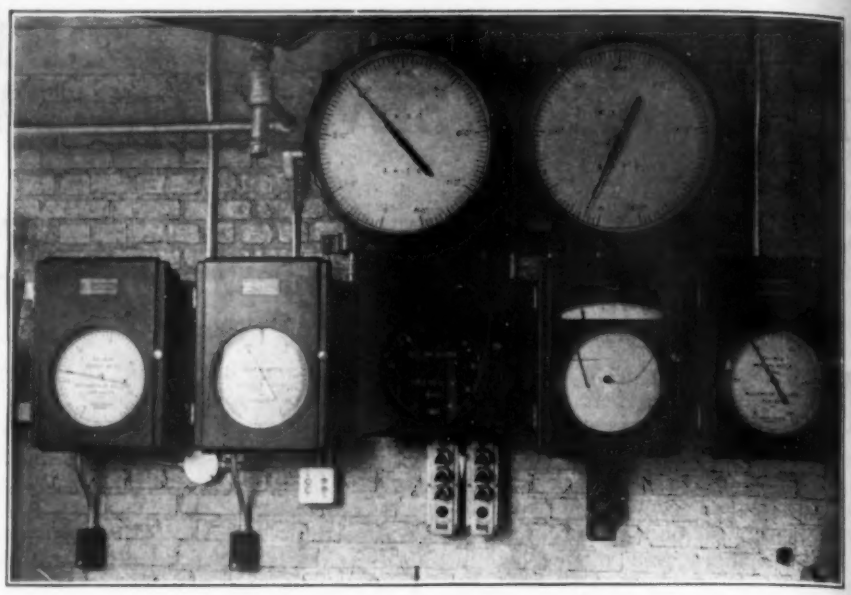


Fig. 2. Indicators in Central Control Room

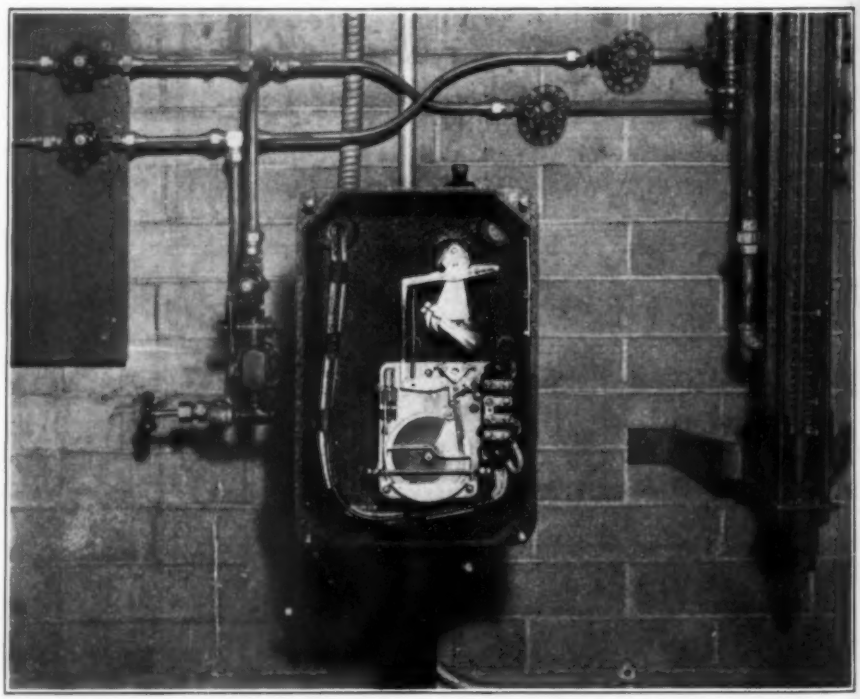


Fig. 3. Chronoflo Transmitter

in proportioning the sludge introduction was as follows:

1. Operator at central station "C" phoned sludge pumping station operator to deliver a specified rate.

2. Pumping station operator would manipulate pumps to give required rate as nearly as possible, as shown by the two Venturis there, and phone back to central station the actual reading.

3. Central station operator would then determine the proportion of sludge to deliver to the two plants, walk out to valves "V" (some distance away), set them manually, according to his judgment and experience; then walk to No. 3 meter and read same. This might not show desired rate, then there would be another valve setting necessary. Sometimes three trips would be required before a satisfactory sludge rate was secured. This "cut-and-try" sequence required much time and effort in the vain endeavor to produce smooth operating results during periods of rapidly varying rates of incoming raw sewage.

The return sludge sent to the so-called "waste sludge" conditioning tanks (Fig. 1) is measured by a 4.5 mgd Venturi meter (No. 4). The control valve for this line is near-by. This sludge is not used in the purification process but is sent to the Milorganite fertilizer plant.

The New Control

Now, in contrast to the old control, a striking improvement in efficiency of operation has been accomplished and maintained for the last ten months through centralization of flow reporting and control in central control room "C." Important changes were necessary:

1. Motorization of the return sludge valves "V," with push button control in control room.

2. Telemetering of the readings of Venturi sludge meters Nos. 1 and 2 to control room.

3. Summation, in control room, of the readings of the twenty-four Venturis on the mixed liquor lines to the West Plant aeration tanks.

4. Motorization of the valve controlling rate of sludge to the conditioning tanks, with push button switch in control room.

5. Telemetering of No. 4 meter readings to the control room.

Looking into central control room "C" (Fig. 2), the two upper large Indicators show the amount of opening of the mixed liquor gates "GE" and "GW." In the row below are five electrically-actuated receiver gauges, from left to right as follows:

1. Return sludge from pumping station: rate indicating; 48-in. Venturi meter No. 1; maximum graduation 40 mgd.

2. Return sludge from pumping station: rate indicating; 48-in. Venturi meter No. 2; maximum graduation 70 mgd.

3. Return sludge to East Plant: rate indicating; 36-in. Venturi meter No. 3; maximum graduation 45 mgd.

4. Return sludge to conditioning tanks; rate indicating; recording, totalizing; 12-in. Venturi meter No. 4; maximum graduation 4.5 mgd.

5. Mixed liquor to West Tanks: totalized rate of twenty-four 24-in. Venturis; maximum graduation 250 mgd.

Push button controls for return sludge valves V will be noted below Gauge 3; for return sludge to the conditioning plants, below Gauge 4.

All of the gauges are Builders Iron Foundry "Chronoflo," except No. 3 which is a Simplex selsyn-motor-actuated. The distant Chronoflo Transmitter for Gauge No. 2 is shown by Fig. 3. It is installed near its Venturi tube and air-pressure-connected to the latter. The time interval signals, proportional in duration to the rate of flow, are sent electrically to the gauge every fifteen seconds.

The most interesting is totalizing Gauge No. 5. Taken by itself, it is no different in design from the other Chronoflo Gauges but on an adjacent wall is the Chronoflo "Summator" (Fig. 4), contained in a cabinet 28-in. by 18-in., which receives the fifteen-second interval impulses from each of the distant twenty-four mixed liquor Venturi meters. The complete cycle of summation for these is twelve minutes. In the upper left-hand corner of this assembly is the final integration mechanism

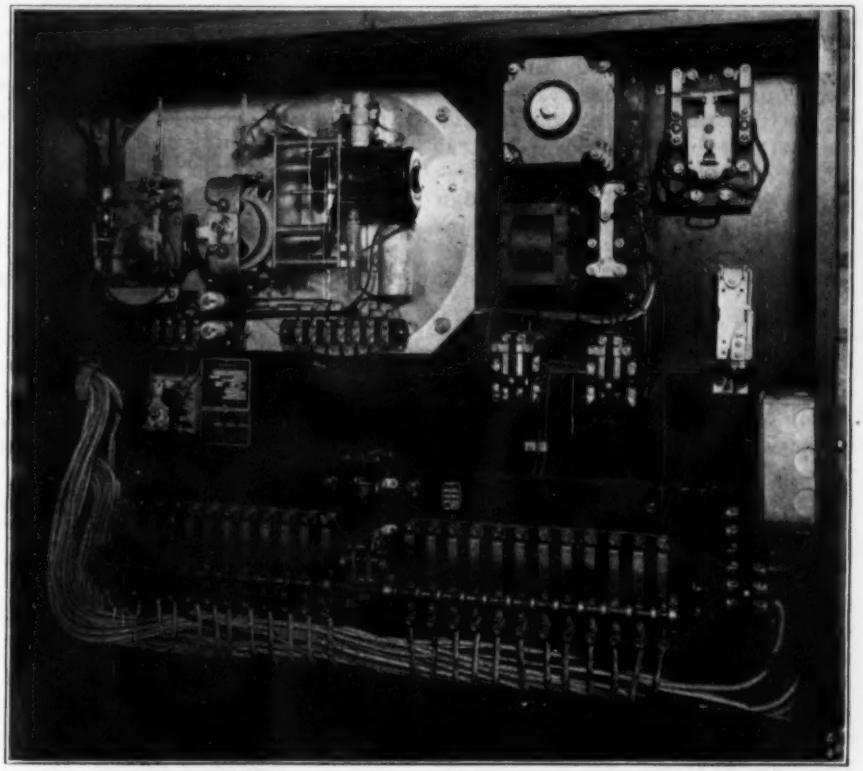


Fig. 4. Chronoflo Summator for Totalizing Gage
(Impulses from each of the 24 mixed liquor Venturi meters are received at 15 second intervals. Complete cycle for summation is 12 minutes)

and its Transmitter which is electrically connected to Master Gauge (No. 5). The individual Venturis at the aeration tanks are equipped with Builders Type M Indicators, water-float-operated, to each of which a Chronoflo Transmitter is attached. The entire installation was installed and placed in successful operation by Chief Electrician Ross Lombard, without assistance from the manufacturer. Many checks have been made on the accuracy of the summation by comparing the totals of the individual type M readings with those of the Master Gauge. These readings, taken at random from the records, show the closeness of agreement:

Millions of Gallons per Day	
24 Meters	Master Gauge
64.7	65.0
88.0	89.3
99.0	100.0
64.9	64.0
87.0	87.9
101.5	101.0

The operating procedure now is much simplified. As before, the central operator telephones the desired rate of return sludge to the pumping station engineer who regulates the discharge approximately to this figure. Incidentally, Venturi sludge meter No. 4 enters into the picture since its rate, as shown on Gauge No. 4, must be included in the total rate required. The *actual* total pumpage of return sludge, therefore, is the sum of the readings of Gauges 1 and 2. Having observed the total flow by gauge No. 5 of the mixed liquor to the West Plant, and to the East Plant by taking the readings of the twelve Venturi meters there, the central operator now determines the required rate of flow of return sludge to each plant. He obtains these respective rates by setting valve "V" by the push button control until Gauge No. 3 shows the correct rate to the East Plant. It is obvious that the sludge rate to the West Plant is the summation of readings of Gauges 1 and 2 minus the summation of Gauges 3 and 4. The operator can observe at a glance any change in the sludge flow and correct accordingly.

The four conditioning (and settling) tanks receive a mixture of return sludge, measured by meter No. 4, from the large settling tanks and the liquid discharged from the sludge filters. The so-called "waste sludge" from the conditioning tanks is sent to the Milorganite fertilizer plant. The aim is to maintain a high concentration of solids in this sludge to reduce the volume of liquid treated to a minimum. The greater the concentration, the less ferric chloride is required per ton of solids treated; the maximum concentration is accomplished by maintaining a higher blanket of solids in the conditioning tanks than desirable in the main settling tanks.

The present equipment has performed its functions most satisfactorily, but to complete the centralization the twelve Venturi meters at the East Plant are to have automatic summation. From the great improvement in plant operation already accomplished, it is confidently expected that practically perfect overall control from central room "C" will be possible and that the solids concentration in the mixed liquor can be maintained within 1 per cent —not as an average, but continuously, day after day.

The cooperation of James L. Ferebee, Superintendent and General Manager, is gratefully acknowledged in the preparation of this article.

Reeves Newsom Becomes Village Manager

On March first, a well known water works engineer, Reeves Newsom, of Newsom and Aldrich, Engineers, became successor to the late Arthur Boniface as Village Manager of Scarsdale, N. Y.

Born in Columbus, Ind., in 1893, Mr. Newsom received a degree of Bachelor of Science in Civil Engineering from Purdue University in 1913. A year of post graduate work at Massachusetts Institute of Technology was followed by his employment as engineer by the city of Lynn, Mass., where he remained for 12 years. During this period he was successively Engineer in charge of Water Supply Construction, Superintendent and Engineer of the Water Department, and Commissioner of Water Supply.

During the last eight years of this period Mr. Newsom was a member of the Commission on Ways and Drainage in Lynn, which board directed the engineering and the construction of all public works projects, and had charge of the operation of the street, sewer, refuse disposal and street lighting departments.

In 1926, Mr. Newsom became Executive Vice President of the Community Water Service Co. in New York, and in 1932 President. For 10 years or so he was in direct charge of the general operations of the company, which owned a large number of individual water companies located in many states, including the New Rochelle Water Co., which furnishes water wholesale to Scarsdale.

In 1937, Mr. Newsom resigned from the Community Water Service Co. to enter private practice as a consulting engineer specializing in sanitary engineering problems. In 1941 the partnership of Newsom and Aldrich was formed with offices in New York City. Recent activities of this firm have included the design

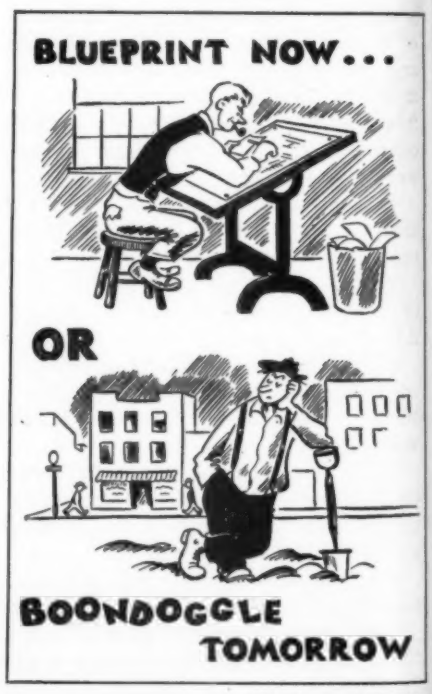
Reeves Newsom

and supervision of construction of water supplies for the cities of Norfolk, Newport News, and the Hampton Roads area in Virginia, the total cost being over $7,000,000.

Mr. Newsom's partner, E. H. Aldrich, will continue the business of the firm, with offices in New York City and Williamsburg, Va.

Mr. Newsom is a member of various technical societies, including Am. Soc. C. E., A. W. W. A., Boston Soc. of Civil Engineers, N. E. W. W. A., Fed. Sew. Wks. Assn., and Natl. Assn. of Prof. Engrs.

Reeves Newsom is well known in the water works field, having been president of A. W. W. A. in 1938-39. Scarsdale's recognition of the desirability of Mr. Newsom from some 100 candidates is to be applauded. Scarsdale's unique government (now 15 years old) represents an advanced effort in municipal administration where the six members of the Board of Trustees are, in general, business and professional men who serve independent of political ties. The Trustees are nominated by a special citizens committee representing the civic and improvement associations of the community. Such nominations result in a single ticket at election time. The Trustees elect a mayor, which is considered quite an honor. Malcolm Pirnie, past president of A. W. W. A. and now president of A. S. C. E., has served a term as Scarsdale's mayor.



(Courtesy AWWA)

"Tale of Two Cities?"
—Could Be!

26TH TEXAS WATER WORKS AND SEWERAGE SHORT SCHOOL

America's Oldest Operator Training School Experiences Record Attendance of 403

THE 26th Texas Water Works and Sewerage Short School was held at A. & M. College, College Station, Texas, during the period Jan. 31 through Feb. 2, 1944. With 403 registered, the attendance at this pioneering Short School broke all previous records. The Texas operator training school was established for water and sewage plant operators and superintendents 26 years ago by V. M. ("Vic") Ehlers, as one of his far seeing plans toward the future as the Lone Star State's Chief Engineer to the State Board of Health. This pioneering movement is believed to have been the first of its kind in America. The results speak for themselves.

An outstanding program of prominent and distinguished speakers as well as subjects of considerable importance at this particular time was presented. Col. Harold W. Keller, Chief of the Repairs and Utilities Division, Corps of Engineers (Eighth Service Command) addressed the group on "Operation of Utilities at Army Posts," and A. M. Rawn, President of the Federation of Sewage Works Associations and Chief Consultant to the Sewerage and Sanitation Branch of the W.P.B. discussed "Recent Developments in Priorities and Priority Procedure." Ray B. Plummer, Office of War Utilities, W.P.B., came from Washington to explain the "Functions of the Water Division of the Office of War Utilities," while "Manpower Problems" were discussed by Capt. David Smallhorst (Sanitary Corps) attached to the War Manpower Commission in Washington.

Of considerable interest to the group was the discussion by Brig. Gen. L. F. Guerre, Director, Internal Security Division of the Eighth Service Command, on the "Use of Prisoners of War on Public Works," some cities in Texas having already begun to draw from this source of labor for public works projects.

Monday evening there was a joint session for the twenty-two district water and sewage associations of Texas. Mr. Edward J. Cleary, Managing Editor, *Engineering News-Record*, gave an interesting and entertaining review of his recent tour through South America, illustrated with slides he had made of sanitary practices in these countries. A "Quiz Program" and "Story Telling Contest," with participation from the group, proved very entertaining.

V. M. (Vic) Ehlers
(Founder of the Texas Short School)

Post-War Plans a Program Feature

One subject which is of very timely interest and had a very prominent place on the program was the importance of "Post War Planning." E. L. Filby, Field Director for the Joint Committee on Water and Sewage Works Development, addressed the group on "Blueprint Now"; V. M. Ehlers, Texas' State Sanitary Engineer, outlined the necessity of planning along sanitary engineering and public health lines, while Dean Gibb Gilchrist of A. & M. College and also Chairman of the State Post War Economic Planning Commission talked about the functions of the Commission. Since the City of Dallas, Texas, has been giving extensive thought to and early preparation of post-war plans, Homer A. Hunter, Supt. of the Dallas Water Dept., presented a review of these activities.

The Water Supply Security Program was discussed by R. E. Tarbett and Carl E. Schwob of the U. S. Public Health Service. F. J. Moss, of the District Office of the U. S.. Public Health Service, explained the new U. S. Standards for Drinking Water, while "The Internal Security Program of the U. S. Army" was described by Capt. Wm. L. Avrett of the Eighth Service Command.

Major A. E. Williamson of the Office of the Coordinator of Inter-American Affairs from Washington summarized the activities of this office in the Latin American countries.

Mr. W. H. Wisely, Executive Secretary of the Federation of Sewage Works Associations, Champaign, Ill., was present at the meeting and explained the objectives and progress of the Federation. The group of men interested primarily in sewage treatment and plant operation had a special meeting and prepared a revised constitution for the Texas Sewage Section which elected its own group of officers.

Grease Removal Important Sewage Topic

Thomas L. Amiss, Supt. of Water Works and Sewerage, Shreveport, La., and AWWA Director from the Southwest Section, and R. L. Harding, President of the Water Company of South San Antonio, Texas, and Chairman of the Southwest Section, AWWA, summarized the "Wartime Program of the American Water Works Association."

"Water Main Cleaning as a Wartime Measure" was discussed by James R. Brown of the National Water Main Cleaning Co., Chicago, and "Anthrafilt for Water Treatment" was presented by Homer G. Turner, Research Engineer of the Anthracite Equipment Corp. of State College, Pa.

Major Rolf Eliasson, U. S. Corps of Engineers, North Atlantic Division, contributed a paper dealing with "Grease Removal," which was read by M. S. Mahlie, Supt. of Water and Sewage Treatment at Fort Worth, Texas, who also contributed a noteworthy discussion on the currently engaging topic, "Grease Removal," which is not as minor a problem as appears to have been assumed in the past.

In addition to these guest speakers, many subjects relating to water and sewage practice were presented by well qualified Texas members.

Col. Hardenbergh and Dr. Cox Dinner Speakers

At the annual dinner, Col. W. A. Hardenbergh, Chief of the Sanitary Corps of the U. S. Army, reviewed the activities and outstanding accomplishments of the Sanitary Corps

in World War II. Col. Hardenbergh made a most interesting talk in revealing the gratifying results that have been obtained through the efforts and plans of the Sanitary Corps.

Also at the dinner Dr. George W. Cox, State Health Officer for Texas, reviewed the progress and accomplishments in the water and sewage fields during the past year. Dr. Cox also announced the Honor Roll of Texas Water Works and Sewerage Systems for 1943, and made awards of appropriate loving cups and plaques to certain of these cities for outstanding achievement. Several individual awards were made by the Texas Water Works and Sewerage Short School to members for special and outstanding service rendered during the past year. Each guest speaker was presented with a properly inscribed edition of the newly revised "Manual for Water Works Operators," produced as a project of the Texas Short School.

Officers Chosen

Officers elected to serve this organization during the ensuing year were:

President—W. F. Hicks, City Engineer, Paris, Texas.

1st Vice-Pres.—W. N. Joiner, Water and Sewer Supt., San Marcos, Texas.

2nd Vice-Pres.—Joe B. Winston, Univ. of Texas Med. School, Galveston.

3rd Vice-Pres.—S. L. Allison, Sewer Supt., Corpus Christi, Texas.

4th Vice-Pres.—N. E. Trostle, Water Supt., Temple, Texas.

Secy.—V. M. Ehlers, Chief Engr., State Dept. of Health, Austin, Texas.

Asst. Secy.-Treas.—Mrs. Earl H. Goodwin, State Dept. of Health, Austin, Texas.

Fortieth Anniversary of Gillette Publishing Co.

This year marks the fortieth anniversary of the Gillette Publishing Co. It was in 1904 that Halbert P. Gillette and his friend and coworker, the late Myron C. Clark decided to resign their jobs with America's largest engineering publishing house and venture into business for themselves. Prior to this time Mr. Gillette had been an associate editor of "Engineering News" and Mr. Clark was manager of the technical book department.

After writing a small book on "Economics of Road Construction," Gillette received encouragement from Mr. Clark to prepare a book on "Earthwork and Its Cost." Immediate acceptance gave confidence to both men to form a publishing partnership.

Thus with limited experience and capital of little more than $500 began the business which today is the Gillette Publishing Co. The first efforts of this partnership resulted in "Rock Excavation Methods and Costs" written by Gillette. Many other books by Mr. Gillette and other authors followed. One of the most notable was Gillette's "Handbook of Cost Data," a book that has had wide acceptance.

In the field of periodicals, the first was "Engineering-Contracting" a small monthly magazine successful because of its practical and lively character.

Changing its name to "Engineering and Contracting" to indicate a broader scope, the magazine became a weekly and devoted its pages to interests of engineers and contractors in the construction field. Associated with the project was Charles T. Murray, who still continues as managing editor of "Roads and Streets."

In 1922 Edward S. Gillette joined his father and in 1928 took over general management of the company and has directed the developments of the past 15 years.

In 1923 "Engineering and Contracting" began to serve its field through the medium of specialized issues with one issue each month devoted respectively to roads and streets, water works and sewerage, railroads, and buildings and structures. In months having five publication dates the fifth issue was on construction equipment and materials.

With the practical cessation of railroad building in the United States the issues devoted to that subject lost interest. The building and structures issues likewise waned, but for different reasons, and sound considerations dictated that these publications be discontinued. The two remaining issues "Roads and Streets" and "Water Works and Sewerage" were changed into their present form of independent monthly magazines. Charles T. Murray was in charge of the former and Linn E. Enslow became editor of Water Works and Sewerage in 1931.

Since that time WATER WORKS AND SEWERAGE has had a steady and expanding growth and acceptance in the sanitary engineering field. Wider coverage and reporting of technical meetings, publication of outstanding articles on water purification and sewage treatment has resulted. One issue each year has been devoted to reference and data material and so large has this compilation become that it is now necessary to alternate about half of the material each year. A year ago to meet the expanding service of the magazine the editorial staff of WATER WORKS AND SEWERAGE was expanded by the addition of Dr. George E. Symons as Associate Editor.

"Good Roads," the first highway magazine in the United States was bought by Gillette Publishing Co. from it founder the late E. L. Powers. This magazine was combined with "Roads and Streets." Victor J. Brown, now a Lt. Colonel in the Army, was publishing director of "Roads and Streets from 1935 to 1942 when he joined the armed forces. Harold J. McKeever joined the editorial staff of "Roads and Streets" in 1942 and became editor in October, 1943.

In the middle 1920's there were two annual highway catalogs in this country one by Powers and one by Gillette. After Mr. Power's death his widow Nan S. Powers, continued to publish "Power's Catalog" until 1933 when she and the Gillette Publishing Co. merged their interests under the title, "Powers' Road and Street Catalog and Data Book." Since then the catalog has been published annually by Gillette with Mrs. Powers as director and J. C. Black editor.

Newest of the Gillette publications is "Caminos y Calles," a Spanish magazine on roads and streets. Published in alternate months this magazine is not merely a Spanish edition of the American "Roads and Streets" but covers the South American roads and streets problems and solutions. Collaborators from various South American countries contribute to the editorial content of the magazine. John C. Black is editor of Caminos y Calles and Carlos Toral is editorial secretary and translator.

Four decades of successful service to engineers, contractors, water and sewage plant operators, superintendents, managers, road builders, public works officials, and many others in the field of public service; that is the service record of the Gillette Publishing Co. With the continued interest of readers and financial support of our advertisers we hope and look forward to many decades of such service.

NEW JERSEY SECTION'S WINTER MEETING

Chairmen

Outgoing	Incoming
Wm. G. Banks *Div. Engr.* *Division of Water* *Newark, N. J.*	*A. F. Eschenfelder* *Borough Engr.* *Glen Ridge, N. J.*

MEETING in Newark, N. J., on Feb. 10, the New Jersey Section of AWWA held its annual winter meeting.

Officers chosen for the ensuing year were:

Chairman

A. F. Eschenfelder, Borough Engr., Glen Ridge, N. J.

Vice Chairman

George Norcom, Cons. Engr., Red Bank, N. J.

Secretary-Treasurer

Cyril Tyggert, Dist. Mgr., W. & T., Newark, N. J.

Trustee

William Collings, Supt., Collingswood, N. J.

Director, AWWA

J. Arthur Carr, Supt., Ridgewood, N. J.

A new Research and Advisory Committee was appointed for the expressed purpose of extending help to the small plant operator.

Fuller Award to Griffin

The George W. Fuller Memorial Award Committee selected A. E. Griffin, San. Engr., Wallace and Tiernan Co., as recipient of the 1944 award "for his contributions to research in safeguarding water supplies by chlorination and particularly the development and application of break-point chlorination and his services to the New Jersey Section."

In accepting the honor, "Griff," as he is known throughout New Jersey and most of the country, said, ". . . Whatever I may have accomplished in the water works field would not have been possible without the whole-hearted cooperation of my many friends in New Jersey and elsewhere, the help and advice of my associates, and the generosity of my employers."

Technical Session

Talks on "Safety as It Pertains to Water Works Construction," by Fred Eitel, Asst. Supt., Newark Div. of Water, and on the "Sea Water Desalting Kit," by W. H. Reed of the Permutit Co., preceded the Question and Answer period. The latter talk was accompanied by a demonstration of the desalting kit, which has now been adopted by the military services and is being manufactured by Permutit for placement in planes and boats.

The "Question Box" proved the occasion for the first performance of the new Research and Advisory Committee. A few of these questions and answers are given herewith.

J. E. Garrett, Design Engr., Newark Water Div., says that with modern fire pumping apparatus very low pressures in fire lines is sufficient, that pressures of 125 psi do not require fire pumpers, and that firemen seem to prefer lower main pressures and use of fire pumpers rather than high pressure fire lines.

Fuller Award
A. E. Griffin
Wallace & Tiernan
Newark, N. J.

Director-Elect
J. Arthur Carr
Supt. of Water
Ridgewood, N. J.

A. E. Griffin, answering the question of whether free active residual chlorine could be distinguished from chloramine residual chlorine, said that the flash, or instantaneous, color reading indicates the so-called "free" chlorine, whereas the five minute color with O-T indicates total "available" chlorine. In the case of manganese interference with the flash reading, Hallinan's arsenite method may be used.

Meters should be tested regularly; N. J. stipulates the periods. Large meters should be tested more often than small meters. For the "duration," one man suggests "in-service" or field testing to reduce testing costs and man-power requirements.

According to one authority, lead joints may be poured in such a manner as to eliminate the difficulty caused by moisture. A dam is placed across the gate, cutting it in two. Pouring the molten lead down one side will drive the moisture out the other. This is said to work even on large diameter pipe without trouble from solidification at the bottom of the joint.

What to do with current surplus water revenue brought mixed ideas. In N. J. it is impossible to earmark such surpluses. Mr. Wm. Banks (Newark) suggests that the surplus be put in a public Works Reserve Fund. Another suggested that the surplus be put in War Bonds for reserve. This reporter told of the action in Maine, where a law has been passed allowing utilities to set aside 5 per cent for postwar planning and construction. [Elsewhere in this issue W. R. LaDue discusses the new Ohio law which protects water works surplus against capture, permits its use for construction of sewerage facilities and their operation as first call after all water supply needs have been met.—Ed.]

According to Mr. Garrett (Newark), anyone can operate an electrical water leak detector, but it often takes an expert to interpret the results.

Sleeping meters are those that work sometimes and sometimes do not. This "sleeping" is usually caused by interference of small objects in the meter.

Weston Gavitt, Cons. Engr., Plainfield, N. J., said that air in a pipeline or main will reduce the discharge of the line. The best remedy is an air relief.

Next meeting of the section will be on May 11 in Trenton, and the Fall meeting will be held in Atlantic City Nov. 3-4 with a get-together on the evening of Nov. 2.

Other Officers

Trustee: Wm. E. Collings, Supt., Water Works and Sewerage, Collingswood, N. J.

Vice Chairman: George D. Norcom, Consulting Engr. and Chemist, Red Bank, N. J.

Secy.-Treas.: C. B. Tygert, Distr. Mgr., Wallace & Tiernan Co., Newark, N. J.

WATER AND SEWAGE PATENTS

(OF RECENT ISSUE)

WATER PATENTS

FILTER BED FILTRATION WITH FILTER BED CLEANING. Charles Lose, Jr. U. S. 2,339,084. Jan. 11. A filtration apparatus consisting of a plurality of concentric filter channels, annular filter beds of granular material, with upper influent chamber and lower effluent chamber and means for controlling flow of water and traveling nozzle cleaners individual to said beds for independent cleaning thereof and means for controlling wash water.

PROCESS FOR REMOVING CATIONS FROM LIQUID MEDIA Gaetano F. D'Alelio (to General Electric Co.). U. S. 2,340,110. Jan. 25. A method for removing cations from liquid by contact with an insoluble, infusible copolymer made from at least one compound containing (1) the polymerizable $CH_2 = C =$ group and one other polymerizable group with non-conjugated, unsaturated bonds, (2) styrene, and (3) maleic acid.

PROCESS FOR REMOVING CATIONS FROM LIQUID MEDIA. Gaetano F. D'Alelio (to General Electric Co.). U. S. 2,340,111. Jan. 25. A method for removing cations from liquid by contact with an insoluble, infusible copolymer made from (1) at least one compound having a polymerizable $CH_2 = C =$ grouping and one other polymerizable grouping with non-conjugated double bonds, and (2) at least one acrylic acid having the formula

$$CH_2 = \underset{\displaystyle R}{\overset{\displaystyle |}{C}} - COOH$$

where the R group is hydrogen, chlorine, bromine, or monovalent alkyl, aralkyl, aryl, or alkaryl radicals.

DEAERATING APPARATUS. Charles I. Baker. U. S. 2,339,369. Jan. 18. A boiler feed water deaerator comprising an accumulator tank for collecting condensate from boiler steam and a deaerating tank with outlet for gases, etc.

PIPETTE. Waddy T. Mathis (to Clay Adams Co., Inc.) U. S. 2,339,870. Jan. 25. A combination pipette tube and bulb with the bulb inside of a metal loop which contains a small piston which may be operated by the thumb or finger, thereby actuating the bulb for filling the pipette.

LEVEL INDICATOR FOR PRESSURE BOILERS. Elbridge Gatewood. U. S. 2,339,922. Jan. 25. A fluid level indicator for pressure boiler composed of a hollow tube made of non-magnetic material, with a hollow vessel, made of magnetic material, the tube surrounded by a magnet. The vessel indicates the level of the liquid in the boiler.

HYDRAULIC WATER PUMP. Ernest W. Gutsch. U. S. 2,339,990. Jan. 25. A deep well pump comprising a primary pressure pump unit at the top of the well, and a water lift unit imbedded in the well at the lower end thereof.

APPARATUS AND METHOD FOR PURIFYING WATER. Willis R. Whitney (to General Electric Co.). U. S. 2,340,721. Feb. 1. Projection of a solution near freezing point onto a plate below freezing point with consequent freezing of solvent while possible occluded impurities are washed from frozen solvent by continuous flow of jetted solution.

BOILER WATER CONDITIONER AND BLOWOFF SYSTEM. Lewis O. Gunderson and Oland W. Carrick (to Electro-Chemical Co.). U. S. 2,340,468. Feb. 1. Structural details of boiler water blowoff and steam space.

FLOAT GAGE. Paul Savko, Jr. (one-half to Andrew M. Kozacik). U. S. 2,340,616. Feb. 1. A depth measuring device having a float with a radial slot adapted to slidably receive a weighted measuring tape.

LEAKPROOF SWIVEL JOINT FOR PIPES. Howard C. Krone and William Meyer (to A. W. Wheaton Brass Works). U. S. 2,341,449. Feb. 15.

JETTY STRUCTURE. George W. Rehfeld. U. S. 2,341,515. Feb. 15. A jetty structure for controlling river and surface water, composed of upright members and a vertical metal mesh.

WATER SUPPLY SYSTEM. Geo. A. Wieland. U. S. 2,341,517. Feb. 15. A combination of a water supply system having an intake pipe submerged in a body of water and a well connected to said pipe below the water level of said body of water.

PUMP UNIT. William L. Dunn and Fred C. Rankin. U. S. 2,342,183. Feb. 22. A reversible centrifugal pump.

VALVE. Frederick H. Hehemann. U. S. 2,342,276. Feb. 22. A gate valve.

MEASURING AND CONTROLLING APPARATUS. John F. Luhrs (to Bailey Meter Co.). U. S. 2,342,413. Feb. 22. Apparatus for continuously determining the time of detention of a flowing fluid through a given portion of its path by means of a rotatable member at the inlet and at the outlet, means for imparting to said members an angular velocity proportional to the volume rate of flow at the inlet and outlet, respectively, with a means for determining the algebraic sum of said velocities and an indicator therewith.

SEWAGE PATENTS

METHOD AND APPARATUS FOR RECOVERING CHEMICALS OF SULPHATE PAPER PULP. Norman A. Lewthwaite (to Crown Zellerbach Corp.). U. S. 2,339,998. Jan. 25. Recovery and reuse of liquor from sulphate paper pulp digester.

APPARATUS FOR TREATING IMPURE LIQUIDS (2 patents). Douglas C. Reybold and Anthony J. Fischer (to the Dorr Co.). U. S. 2,340,842. Feb. 1. A two stage sewage treatment apparatus with each stage comprising a clarifier and circumjacent trickling filter bed with appurtenances. U. S. 2,340,848. Feb. 1. Arrangement for sewage treatment comprising a primary settling rank with circumjacent trickling filter, capable of being operated as a two stage filter, with a secondary settling tank and means provided for recirculation.

SEWAGE CUTTING OR SHREDDING DEVICE. Nicholas Santucci. U. S. 2,341,817. Feb. 15. A sewage comminuting device consisting of a plurality of spaced bars in the sewage conduit and a movable member having cutting edges whose motion is vertical past the stationary cutting bars.

SEWAGE GREASE REMOVAL APPARATUS. James D. Walker. U. S. 2,342,024. Feb. 15. Apparatus for removing grease from sewage and wastes. Liquor is passed down a central tube by impeller which forces air bubbles down with the liquor. As the liquor rises outside the central tube, the air bubbles break the grease emulsion to form a foam which may be removed.

ESTIMATING SAFE YIELDS FROM SMALL STREAMS

Some New Aspects and Considerations Applicable in Developing Auxiliary Supplies

By WM. C. EMIGH
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CONSIDERED as an independent source of water supply, without provision for storage, it is self-evident that the safe yield of a stream, for a use having a constant and uniform demand, is the extreme minimum flow of the stream. It is also generally understood that by providing storage space permitting the accumulation of a reserve during periods of large stream flows, to be used to supplement the low flows of dry periods, the safe yield of a stream may be greatly increased.

Given run-off records of a stream over a considerable number of years, it is a simple matter to construct a mass diagram and from it to determine the theoretical safe yield of the stream with a given volume of storage or the volume of storage required to obtain the desired safe yield. Perhaps, however, the problem of determining the increase of safe yield resulting from increasing the watershed area tributary to an existing impounding reservoir has not been so commonly investigated. The author recently had occasion to study the possibilities of such an increase of tributary watershed and found the results interesting.

Existing Supply

The City of Coatesville, Pa., derives its water supply from Rock Run, a tributary of the West Branch of Brandywine Creek. A concrete dam impounds the waters of the stream in a reservoir having a capacity at spillway crest level of 332 million gallons. Above the dam the stream has a watershed area of 5.4 square miles. The watershed is partly cultivated and partly in woodland.

Prior to the summer and autumn of 1941 there had seemed to be no reason to question the adequacy of the source as developed to meet the water requirements of the city. In that very dry year, however, the precipitation was only 29.25 inches as compared to a previous low during 54 years of record of 32.7 inches. This extremely low precipitation, combined with considerably increased demand of war industries, reduced

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the stored reserve to approximately 25 per cent of the capacity of the reservoir. At the present time the rate of consumption is substantially higher than in 1941.

Although the present consumption is uncomfortably close to and probably somewhat greater than the safe yield of the stream as developed, it is not considered necessary to obtain at the present time very large additional sources of supply. It is quite possible that it will be a considerable number of years before normal growth will increase consumption much beyond that resulting from the present war emergency.

Proposed Supply

There is another tributary of Brandywine Creek emptying into it above Rock Run known as Birch Run. By the construction of a pipe line approximately two and one-half miles in length, from the existing reservoir on Rock Run, over the divide between the two watersheds, to a point on Birch Run, it will be possible to carry water by gravity from Birch Run to the reservoir on Rock Run.

The point of discharge into the reservoir would be sufficiently above the dam to provide a settling period in the reservoir. The plan includes a small diversion dam on Birch Run but no storage. In operation, no water would be drawn from Birch Run so long as Rock Run supplies the demand and keeps the water level at spillway crest. When the Rock Run flow decreases, sufficient water would be drawn from Birch Run to keep the reservoir full so long as possible. As the yields of the streams decrease, the entire flow of Birch Run can be diverted.

In seeking a determination of the amount of increase of water production which would be made possible by diverting the waters of Birch Run to the Rock Run reservoir, it was assumed that the stream flows of 1941 could be considered about minimum and that the level of water in the reservoir should not be drawn down lower than was done during the protracted drought of that year. Actually the lowest water level was reached January 18, 1942. Although direct gaugings of stream flows in 1941 were not made, the metered production, compared with the loss of water in storage, afforded a satisfactory estimate of the flow of Rock Run. Birch Run watershed is of the same general character as that of Rock Run so that an estimate of flow 0.8, that of Rock Run, appears conservative.

Conditions in 1941

The accompanying Table I indicates the conditions actually observed during the drought of 1941. Referring to column (1), the reservoir water level was last at spillway crest June 18, 1941, and the lowest level (15.8 feet below spillway crest) was reached January 18, 1942. Column (2) shows the output of the filtration plant as indicated by meter readings, plus water used for filter washing, dry feed machines, etc., at the filtration plant. Column (3) is an estimated loss by evaporation based upon observations at comparable reservoirs, and column (4), being the sum of columns (2) and (3), represents the entire yield of the reservoir.

Column (5) is obtained from water level gauge readings and the original computations of reservoir capacities at various water levels. Differentials of the quantities of column (5) indicate the reduction in reserve during each period as shown in column (6) and these reductions, subtracted from the total reservoir yields of col-

TABLE I

Consumption and Yield of Rock Run as Actually Observed in 1941

(1) Period	(2) Total Drawn from Reservoir Incl. Wash Water Etc. M.G.	(3) Estimated Evaporation M.G.	(4) Total Yield of Reservoir (2)+(3) M.G.	(5) Reserve in Reservoir at End of Period M.G.	(6) Reduction in Reserve in Reservoir During Period M.G.	(7) Yield of Rock Run in Period (4)—(6) M.G.	(8) Average Yield of Rock Run During Period M.G.D.
June*	29.44	4	33.44	318	14	19	1.46
July	72.05	9	81.05	294	24	57	1.84
Aug.	73.13	8	81.13	248	46	35	1.13
Sept.	68.72	6	74.72	185	63	12	.40
Oct.	66.49	5	71.49	136	49	23	.74
Nov.	60.61	3	63.61	108	28	36	1.20
Dec.	63.42	2	65.42	106	2	63	2.03
Jan.†	43.22	1	44.22	85	21	23	1.28

*June 18-30/1941. †January 1-18/1942.

TABLE II

Estimated Effect of Consumption 0.95 M.G.D. Greater Than Consumption of 1941 Upon Reserve in Pock Run Reservoir If Yield of Birch Run, Estimated at 0.8 of That of Rock Run, Be Added to Yield of Rock Run

(1) Period	(9) Total Yield of Reservoir (4)+.97 M.G.D. M.G.	(10) Yield of Birch Run in Period (7)x0.8 M.G.	(11) Available from Birch Run After Deduction for Flash Flows M.G.	(12) Total Available from Rock Run and Birch Run (7)+(11) M.G.	(13) Loss or Gain in Stored Reserve in Reservoir (12)—(9) M.G.	(14) Stored Reserve at End of Period M.G.
June*	46.05	15.2	15	34	—12	320
July	111.12	45.6	44	101	—10	310
Aug.	111.20	28.0	27	62	—49	261
Sept.	103.82	9.6	9	21	—83	178
Oct.	101.56	18.4	18	41	—61	117
Nov.	92.71	28.8	28	64	—29	88
Dec.	95.49	50.4	48	111	+16	104
Jan.†	60.68	18.4	18	41	—20	84

*June 18-30/1941. †January 1-18/1942.

umn (4), provide the estimate of yield of Rock Run shown in columns (7) and (8).

Forecast Conditions

Table II is intended to forecast the conditions which would exist if there were exactly duplicated the stream flow conditions of 1941 but with Birch Run diverted to the Rock Run reservoir and the consumption being 0.95 mgd. greater than the actual consumption in 1941. The 0.95 mgd. is the rate of consumption increase determined by trial method to be that which would produce, under these drought conditions, a low level in the reservoir approximately the same as that of January 18, 1942.

Column (9), the total increased yield of the reservoir, is the yield of the reservoir in 1941, plus the 0.95 mgd. increased consumption, plus 0.02 mgd. increase in wash water for the larger production. Column (10) is the estimated gross yield of Birch Run based upon the observed yield of Rock Run and the 0.8 ratio of watershed areas.

In column (11) a deduction has been made from the gross yield of Birch Run to cover small losses which might occur at times of rains resulting in flash flows exceeding the capacity of the pipe line. At a time of extreme drought it is improbable that much water would be lost in this way. Adding the available flows of the two streams, the totals are shown in column (12) and, by comparison with the anticipated reservoir yields of column (9), the loss or gain in the volume of stored water at the end of each period is obtained, as shown in column (14). It should be noted that the 84 mg. minimum in storage of column (14) is approximately the same as the 85 mg. of column (5).

It thus appears that, although the estimated average daily extreme low flow of Birch Run for a monthly period is only 0.3 mgd., the diversion at the time when the combined flows of the two streams is just sufficient to equal the reservoir yield is so large that the average obtained from Birch Run during the whole period of drought is 0.97 mgd., of which 0.95 mgd. is available for consumption.

Manual for Water Works Operators

Many new features and 106 new pages have been added to the 1943 revised edition of the Manual for Water Works Operators, produced and published by the Texas Water Works and Sewerage Short School.

The new features of the revision include more illustrations; more complete information on measuring water flows; a practical discussion on the servicing and maintenance of domestic meters; helpful directions on odor analysis and control; and other revisions.

Composed of 19 chapters, 7 indexes and 392 pages, the book covers water works practice from source of supply to consumer's tap and all the treatment and measurements in between. The various subjects of interest to the water works operator include a general discussion of water and its impurities; source of supply, both surface and ground; pumping, measuring, and treating water; laboratory testing and control; chlorination, algae control, water softening; and corrosion. Distribution systems, storage reservoirs, industrial supplies, and requirements of state departments are also presented.

The appendixes contain information on licensing of operators, antistream pollution regulations, and the USPHS Drinking Water Standards as well as useful information on publications, specifications, laboratory equipment and data.

The book was compiled under the direction of the Manual Committee of the Texas Water Works and Sewerage Short School, consisting of L. C. Billings, chairman; V. N. Ehlers, W. D. Mahlie, D. W. Robinson and Walter Hicks.

Priced at $3.00 per copy, the book may be obtained by writing Mrs. Earl H. Goodwin, Asst. Secy.-Treas., Texas Water Works and Sewerage Short School, c/o State Health Department Bldg., Austin, Tex.

Hope We Won't Come to This

"Sorry, but the boss is out chopping down trees"

DIFFICULTIES AND LIMITATIONS IN THE BACTERIOLOGICAL EXAMINATION OF WATER

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IN THE search for criteria of the probable purity of waters to be used for drinking and culinary purposes, attention was probably first attracted to such items as turbidity, temperature, odor, taste and hardness. Primitive man undoubtedly was impressed with the desirability of cool, clear, soft and palatable water in preference to warm, turbid, highly colored, hard waters with off tastes and odors. That is, he was concerned primarily with the esthetic properties of water. Unfortunately, there does not always exist a high degree of correlation between these characteristics of a water and its hygienic safety, and although too much emphasis cannot be placed on the desirability of obtaining water with good physical properties, it must be recognized that such criteria as have been referred to are of value only for the detection of gross contamination or the presence of markedly excessive quantities of other objectionable ingredients.

It was not, however, until the latter part of the 19th century, through the establishment of the relationship of microorganisms to the cause and spread of disease and the development of relatively rapid methods for the detection and isolation of bacteria from water, that our most delicate procedures for the examination of water, namely, the bacteriological tests, became recognized as of paramount importance.

Purpose of the Bacteriological Examination

It is the purpose of the bacteriological examination to detect the probable presence of pathogenic bacteria, particularly those which are associated with the more common intestinal diseases such as typhoid fever, paratyphoid fever and dysentery. The natural procedure for the bacteriological examination of water would, therefore, consist of the direct isolation of specific pathogens. Unfortunatley, this obvious and desirable approach has not been feasible. The source of pathogenic organisms in a water supply is always the dejecta of a previous case (man only as respects typhoid fever, but animals as well in the case of several other intestinal infections). Considering that only a relatively small proportion of the human or animal population on a watershed would be ill or carriers; that the intestinal tract teems with myriads of nonpathogenic organisms; and, since streams and lakes receive soil washings which bring in a great number and variety of microorganisms, it is apparent that the specific pathogens, which we are intent on detecting, constitute but a small minority of the microbial flora of a contaminated water. Attempts at isolation of specific pathogens have, therefore, not been generally successful, because of their low incidence, and particularly because the more numerous nonpathogenic bacteria find the common culture media to be particularly favorable for their growth, with the result that they over-grow and crowd out the pathogenic forms. Although special media and techniques that hold promise for the eventual development of methods for direct isolation of pathogens have been suggested from time to time, they have not proved satisfactory for routine analysis. An alternative to this natural procedure has therefore been adopted. It consists of the determination of (1) the number of bacteria developing on nutrient agar at 37° C. in 24 hours, and (2) the incidence of intestinal organisms (the colon group of bacteria) which, though themselves not intestinal pathogens, are easy to isolate and serve as a reasonable index of the probable incidence of pathogens.

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The procedure has been justified by experience, but the question, of course, remains as to whether it is under all conditions a satisfactory and reliable index. There can be no question, however, that the numbers of bacteria vary directly as the amount of organic material in a water course; and that this organic content is a direct function of the quantity of sewage or other wastes finding their way into a water supply. The incidence of bacteria, and particularly of the colon group, therefore, becomes a measure of the degree or proximity of pollution, though not necessarily an equally good measure of the extent of infection.

The Importance of Sampling And Shipping Precautions

It is the purpose of the bacteriological examination to determine the sanitary character of a water at the moment of sampling uninfluenced by contamination during collection or changes which might ensue in the course of transit to a distant laboratory. The problem of sampling is of paramount importance; for no analysis, irrespective of how meticulously it is carried out, is any more significant or reliable than was the collection of the sample. The containers in which samples are all too frequently received in laboratories may bring forth amusement and annoyance; but it is not a matter for laughter, for behind these misconceptions may lurk tragedy. We have

*Note: Since this paper was written, Dr. Levine has entered the Army. At present he is Lieutenant-Colonel in the Sanitary Corps and stationed at Brooke General Hospital at Ft. Sam Houston, Texas.

received in our own laboratory from laymen, medical men, lawyers and chemists, water samples collected in mason jars, bottles stoppered with a cork, five ml. vials, and two to four ounce bottles which had contained medicine or other materials which had not been adequately removed, for the odors of the products were still evident.

The necessity for shipping samples raises the question as to the nature of the changes in the microbial population during transit. In view of the fact that it is the objective of the examination to detect the condition of the water at its source, it becomes necessary to take such extra precautions as are feasible to maintain the microbial flora without change. Unfortunately, no adequate method for attaining this ideal is available. It was formerly the common practice to send samples iced; but this is an expensive procedure and it does not always attain the desired objective. If not iced, the microbial count might rise to tremendous numbers, while the incidence of the colon group frequently decreases or its detection is interfered with. For example, some years ago a number of samples were received from a distant supply, the samples having been shipped in ordinary mailing cases without ice, the air temperature being above 90° F. Examination in the laboratory disclosed bacterial counts of over 30,000 per ml. The government standards at that time stipulated that water should not contain more than 100 bacteria per ml. It was felt, however, that this high count did not warrant condemnation of the supply; for it might have been due to multiplication during transit. Examination of the water in a traveling laboratory at its source disclosed that the supply, which was from a deep well, contained but 6 bacteria per ml. Another example which might illustrate the difficulties in interpreting the bacterial count is illustrated by the following situation. A sample of water had been chlorinated and its bacterial count dropped from 800 to less than 10 per c.c., but this same sample, after storage for 48 hours in the course of transit, showed a marked increase in bacterial count, which rose to over 10,000 per c.c. In both of the foregoing examples there was no evidence of presence of bacteria of the colon group in the stored samples. It is because of situations such as these that our former conceptions as to the significance of bacterial counts have been materially modified with respect to treated waters stored in small containers and emphasis is being put more and more on the incidence of the intestinal or colon group of bacteria.

Difficulties in Detection of Colon Group

Attention is therefore focused on the detection and significance of the colon group in water. An outstanding characteristic of organisms of the colon group is their ability to ferment lactose with the production of gas. This character affords a simple criterion for detection of the probable presence of colon organisms. Thus, if a sample of water containing colon bacilli is placed in a tube of lactose broth within which is present a smaller inverted tube, the presence of lactose not only favors growth of the colon group, but as this carbohydrate is decomposed with gas production, the gas is caught in this inner inverted tube, which acts as a trap, and provides simple visual evidence of the presence of a lactose fermenting gas forming organism. This phenomenon is known as the presumptive test for the colon group because the presence of gas is an indication of the probable presence of the sought for organism. This is, however, not a perfect indication, for there are other bacteria occasionally encountered (such, for example, as certain spore forming organisms which are more characteristic of soil and consequently do not have the same sanitary significance as the colon group), which are also lactose fermenters. Further tests must, therefore, be carried out to ascertain whether the organism producing gas was a member of the colon group, which includes only gram negative short rods which do not form spores, but which ferment lactose with gas production and grow aerobically. The method generally consists of smearing a small quantity of liquid from the tube showing gas onto a medium such as Endo agar or eosine methylene blue agar, which permits rapid growth of the colon group with formation of characteristic colonies, but is markedly inhibitory to most other bacteria. This procedure is referred to as the "partially confirmed" test.

Unfortunately, not all colon organisms produce typical colonies upon such plates and sometimes it becomes necessary to isolate organisms from these plates and study them further. Thus it is seen that the time required for bacteriological examination is quite considerable, for it may be necessary to incubate the presumptive lactose broth tubes for 48 hours (recently a question has arisen as to whether it might not be well to extend the period of incubation even longer in order to detect so-called slow lactose fermenters), take an additional 24 hours to ascertain the results on the confirmatory test medium and 24 hours more to determine if gas is produced when a suspected colony from such a partially confirmed plate is inoculated into lactose broth and whether the organism is a non-spore forming gram negative short rod. A week may, therefore, elapse from the time of collection of a sample until a report is received. This relatively slow and time consuming procedure is a serious disadvantage of the bacteriological test. Substitution of a quick chemical test as, for example, the determination of available chlorine, for the detailed bacteriological procedures, when dealing with treated water supplies, may sometimes be feasible but cannot at present be depended upon; though it is admirably adapted, when properly carried out, as an adjunct to the bacteriological test. In the final analysis, the only way to ascertain whether objectionable bacteria are present is to do so by recognized bacteriological techniques.

Those who are concerned with the examination of water are quite aware of the fact that presumptive tests which do not confirm cannot always be dismissed as not containing colon group organisms. Considering that there may be present a mixture of bacteria in the presumptive test tube, it may readily happen, under some conditions, that some of the non-colon organisms as, for example, streptococci, may elaborate products which are detrimental to the colon organism which might have been responsible for gas production, with the result that the colon types are destroyed and not isolated on further tests. Although this may not happen very often, the careful analyst should bear this probability in mind and when he encounters a water supply which repeatedly shows presumptive tests which are not confirmed by routine procedures, he should institute special procedures to see whether he could isolate colon group organisms from such presumptive tests.

Difficulties of Interpretation—Soil vs. Intestinal Forms

Perhaps the greatest difficulty is encountered in interpretation of bacteriological findings. It has been stated that the main objective of bacteriological examination of water

is to ascertain the probable incidence of pathogenic organisms, particularly those associated with human dejecta. The colon group of bacteria has been defined as including those organisms which are gram negative short rods, do not produce spores, ferment lactose with the production of acid and gas and are capable of growing aerobically on ordinary standard nutrient media. This is a very broad characterization within which may be included many species and varieties of bacteria. It is generally recognized that there are two very distinct sub-groups in the colon group, one is referred to as the "Escherichia" or coli section and the other the "Aerobacter" or aerogenes section. In the former is included a very large proportion of the colon group organisms encountered in the intestinal tract of man and animals, such forms being uncommon in soils; whereas the latter group "Aerobacter" comprises the prevailing types of coli-like organisms in soils, and is relatively uncommon in the intestinal tract. A third sub-group of coli-like bacteria (Citrobacter), which is closely related to the Escherichia section, is recognized by some authorities. This group of organisms is rarely encountered in the intestinal tract but it is much more frequently encountered in the soil. The question naturally arises as to whether all of these coli-like bacteria are of the same significance when encountered in water. I might say at the outset that there is considerable difference of opinion, but that it is the general practice, though by no means the universal practice, in this country to assign the same sanitary signficance to all of the species of the colon group encountered in treated waters. The English, on the other hand, as may be seen from the accompanying table, are inclined to put particular emphasis on presence of those organisms which produce indole.

Although in a treated, particularly a chlorinated, supply it is a comparatively simple matter to provide for the elimination of all types of coli-like bacteria to the same degree, the situation is quite different when dealing with isolated farm well supplies where artificial purification cannot be applied and in which the presence of one or another of the various members of the colon group may not have the same sanitary significance because of their different origins.

The problem of standards for drinking waters always has been and always must be integrated with the development of methods of water purification. For example, a generation ago, a water which did not contain Escherichia coli in a majority of one ml. samples was considered to be passable and of fair bacterial quality. The methods of water purification at that time were practically restricted to simple sedimentation or coagulation followed by rapid sand filters. Waters showing colon group organisms, even to the extent of ten per cent of one ml. samples, were considered very good. This, of course, was in the days before chlorination.

The introduction of chlorination made it possible to produce waters of a much lower colon content and in 1914 was enunciated a standard by the United States Public Health Service stipulating in effect that not more than two colon-group organisms be present in 100 ml. In 1925 it was found possible to still further tighten the United States Public Health Service standard and the allowable content of colon organisms was reduced to 1 per 100 ml.

Some Characteristics of Colon Group Bacteria

Genus.	English Committee Designaiton.	Ind.	V. P.	M.R.	Cit.	Gel.
Escherichia	Bact. coli facal. Type I	+	—	+	—	—
Escherichia	Bact. coli facal. Type II	—	—	+	—	—
Citrobacter	Intermediate Type I	—	—	+	+	—
Citrobacter	Intermediate Type II	+	—	+	+	—
Aerobacter	Bact. aerogenes Type I	—	+	—	+	—
Aerobacter	Bact. aerogenes Type II	+	+	—	+	—
Aerobacter	Bact. cloacae	—	+	—	+	+

Very few of us probably realize or really appreciate the delicacy of the bacteriological test which is applied to water, when it is stipulated that there shall not be present more than one colon organism per 100 ml. An average colon organism is about 1/1,000 of a millimeter in length and about half of that in width and thickness so that it weighs but ¼ of a millionth of a millionth of a gram. The quantity is much too small to even be visualized without a great deal of attention being focused on the subject. This quantity in 100 ml. of water would be analogous to detecting an object which weighed about 1/10,000,000 of an ounce in 1,000 tons of material. One should not be surprised, therefore, if it is occasionally missed; the amazing thing really is that detection is so frequently successfully accomplished. Dependence must, therefore, never be put on a single analysis; nor should the practice, fortunately now uncommon, of submitting supposedly duplicate samples to different laboratories and accepting the satisfactory result, be condoned. The differences in findings may be due to changes in the sample en route; variation in distribution of organisms in the water itself or well within the limits of error of the delicate determination involved. A series of samples, even if submitted to a series of laboratories, will obviate such erroneous inferences.

The Question of Sampling Stations

Another problem which arises to plague the water analyst concerns the point at which a sample from a water supply is to be collected and how to interpret the findings. Samples are generally taken at the water purification plant and in the larger cities at various points in the distribution system. Sometimes it is found that samples taken from a consumer's tap show more colon organisms than the plant samples. What is the significance of this increase? Does this mean that the water has been contaminated between the plant and the sampling point or does it mean that the few colon organisms which survived chlorination, (and there are always a few which do survive) found opportunity to grow and multiply in the mains? If the first possibility is the explanation, it would constitute a serious defect in the water system, whereas the second alternative would not be considered quite so serious provided we had reason to believe that specific pathogenic forms had not similarly escaped chlorination and found opportunity for multiplication. An interesting example is the case of a large water supply which was chlorinated and stored in the open before consumption, where it was found that at some seasons of the year there was a distinct increase in the colon index of the water coming from the reservoir as compared with that going into the reservoir. This increase has been attributed to recontamination with droppings from birds and some have felt that it was of no sanitary significance because birds, for example, do not spread typhoid fever. In view of the fact, however, that no sharp line of demarcation has been discovered which separates coli-form organisms associated with bird dejecta from those of human dejecta, it

would be prudent to again chlorinate such a water before discharging it into the mains for distribution to the public so as to at least remove the evidence of contamination.

Because the detection of coli-like organisms in water is a reliable index of the possible, though not necessarily the probable, presence of pathogenic intestinal bacteria, the absence of coli-like organisms has generally been accepted as proof of the absence of pathogens. The question has been raised as to whether such a corollary is, under all conditions, tenable. The development of the concept of the colon group as an index of pollution has been intimately associated with the concept that typhoid fever was the primary, if not the only, intestinal disease to be guarded against. Such a view was perhaps excusable, or at least logical, in the period before the discovery of the paratyphoid and dysentery groups of bacteria. In view of the now universally recognized fact that paratyphoid fever and dysentery are not infrequently water borne, such a concept is no longer tenable without some reservations. In the accompanying table are shown a few of the distinctive physiological characteristics of the Escherichia: Aerobacter (colon) group, the Proteus-Salmonella (paratyphoid) group, and the Eberthall-Shigella (typhoid-dysentery) group.

Differentiation of Colon Typhoid Group

Group.	Genera	Glucose Acid	Glucose Gas	Lactose Acid	Lactose Gas
Colon	Escherichia—Aerobacter	+	+	+	+
Intermediate (paratyphoid)	Proteus-Salmonella	+	+	—	—
Typhoid Dysentery	Eberthella-Shigella	+	—	—	—

To recapitulate, since effective methods have been developed for the detection of the Escherichia-Aerobacter or colon group, it has become the practice to employ the incidence of these organisms as a direct measure of the probable incidence of the other forms which are really the specific pathogens and therefore of primary significance. This use of the colon index is still warranted provided the previous reports to the effect that the colon group is distinctly more resistant to water purification processes, including chlorination, than are the other organisms listed in this table are correct; for, obviously, if this is the case, absence of the colon group would be ample assurance of the absence of the latter organisms. But if any of the para-typhoid-dysentery forms are more resistant than organisms of the colon group, a change in concept becomes imperative.

There have been reported severe outbreaks of intestinal disease (typhoid fever and gastro-enteritis from several large midwestern communities during the past half dozen years associated with water supplies which apparently showed no evidence of excessive incidence of colon bacilli, but, on the contrary, were presumably meeting the U. S. Public Health Service standards for drinking waters on interstate common carriers. Furthermore, a group of Minnesota workers, Heathman, Pierce and Kabler, presented a report in which it was claimed that in a number of instances freshly isolated strains of typhoid organisms had been found to be distinctly more resistant to chlorination than were many of the colon bacilli. Should this work be confirmed, there will be a tremendous impetus toward the improvement and development of rapid methods for isolation of specific pathogens to supplement if not supplant our present colon index in water analysis.

Interpretation of Deep Well Findings

Finally, a few words with reference to the problem of analysis of well water supplies, with particular reference to the difficulties involved in the interpretation of bacteriological findings. It might be said that the United States Public Health Service standards for water on interstate common carriers are directed to produce waters which, on the basis of the colon index, simulate the very best deep well supplies. Experience has demonstrated that such supplies are hygienally safe. Application of this standard to isolated deep wells is, therefore, readily justified, certainly to the extent that the detection of colon forms would be an indication that such a well supply deviates materially from the normal.

If, on examining a shallow well, the water is found to comply with the U. S. Public Health Service standard, there would be no hesitancy in approving it, provided other factors, such as those developed in the sanitary survey, were satisfactory. A serious difficulty arises in interpretation of bacteriological findings which disclose that the water does not quite meet the government standards for drinking waters on interstate common carriers while inspection of the premises does not disclose any probable source of pollution. Should the water, under these conditions, be condemned and, if so, what provision could be made for supplying drinking water to the large proportion of our farm and rural population? It must be borne in mind that the Public Health Service standard was specifically designated for waters on interstate carriers because such waters could be subjected to chlorination or other effective methods of treatment and this standard has been extended voluntarily to municipal supplies which can similarly be subjected to adequate treatment. Furthermore, such municipal and interstate carrier supplies are usually obtained from very large watersheds which are subject to pollution from various and sundry sources. In contrast to this, the isolated well obtains its water from a restricted watershed, subject generally only to the pollution of those using the supply, and this restricted watershed may be easily protected; certainly against human pollution.

The present practice of merely reporting that the water does not meet the standard set for water on interstate common carriers is of very little help to the consumer, who at once interprets this finding as indicating that the water is dangerous.

The problem of interpretation of bacterial analyses of shallow wells is, at present controversial. Possibly differentiation of soil from fecal forms of the colon group may be of assistance. The problem is worthy of careful study. It is desired to emphasize at this point that inspection and assurance of proper construction of a well is frequently more important than the bacterial or any other laboratory examination. A single examination of any water supply, and this is particularly true if the report is satisfactory, should not be depended upon as a criterion of the character of the water.

The occurrence of outbreaks of intestinal disease associated with water supplies, presumably conforming to the U. S. P. H. S. standards, indicates that the colon index may have to be supplemented by other bacteriological criteria.

It should be noted, however, that the present methods of bacteriological examination have proven their worth as indicated by the marked decrease in the urban typhoid and other intestinal disease rate during the past two decades.

SPECIAL SEWER SERVICE CHARGES FOR INDUSTRIAL WASTES

By GEORGE E. SYMONS[1]
and
FREDERICK W. CRANE[2]
Buffalo Sewer Authority
BUFFALO, N. Y.

THE cost of operation and maintenance of any sewage treatment works or disposal plant is directly affected by the quantity, character and strength of the sewage. From this basic fact stems the theory that the fairest and most just distribution of payment for the costs of sewage treatment is the sewer rental system where the user pays for services rendered proportional to the benefits derived.

The volume of water used by a service is generally the basis for sewer rentals. Industrial waste studies, however, have indicated that the concentrations of wastes discharged from certain industries, into a sewer system, are extremely disproportionate to the average for an entire city. Such industries, therefore, when paying sewer rental charges based on volume of wastes alone, do not adequately pay for their share of the cost of treatment of such wastes. Consequently the development of a special rate of charge for such industries based on both the volume and strength of wastes appears proper and just. A formula for such a special charge is developed and described herewith.

Buffalo, N. Y. Sewer Rental Provisions

The State of New York has authorized sewer rentals based on water consumption, fixtures, "or upon any other equitable basis." Chapter 870 of the Laws of 1939 of the State of New York covers the creation of the Buffalo Sewer Authority and repeats the above provision. Under this provision the schedule of sewer rents for Buffalo was drawn and adopted to provide that 45 per cent of the revenue was obtained from assessment against real estate and 55 per cent was to be collected on the basis of water consumption at a rate equal to 40 per cent of the cost of water. It was further provided that where water measured by a meter does not enter the sewer system the sewer rent was to be based on the quantity of water actually entering the sewer system and so determined.

In addition, the sewer rental schedule contained the following provision for special charges. "In event a lot, parcel of land, building, or premises discharges into the sewerage system sewage or other wastes which in the opinion of the Buffalo Sewer Authority, contains unduly high concentrations or any substances which add to the operating costs of the sewage disposal works, then the Authority may elect to establish special rates of charge, based on the quantity of these substances, which rate of charge may be established in such a manner as the Authority may elect, or it may elect to exclude such sewage or trade wastes from its facilities."

From these provisions came two problems which confronted the Sewer Authority in regard to sewer rental charges to industrial establishments. The first of these problems arose from the protest by industries against paying sewer rental charges for water not reaching the sewer system, either due to its absorption in industrial processes, its discharge into available watercourses, or the absence of sewerage facilities. The second problem covered the supplementary charge for wastes disproportionately costly to treat.

In handling the first problem, a survey was made of all properties concerned. Where there was no sewer the matter was simple; no rental charge was made. Where water was consumed in productive processes or otherwise used up and not discharged, the attempt was made by a rational analysis to determine the average amounts so used and establish therefrom a proportion of the water consumption on which the rental charge was to be based. Little trouble was experienced with this procedure; it being generally acceptable to industry.

Each year a survey has been made of all accounts upon which the established reductions were based. These reductions have been in effect for nearly five years and no general field check has yet appeared necessary.

Somewhat as an integral part of this program has been the establishment of rental charges for water obtained from a source other than the municipal supply. Sewer rental is charged for this water at the same rate as for city water. Industries obtaining water from wells or streams are required to install and maintain meters which are read by the Sewer Authority.

Industrial Waste Survey

As an attack on the second problem, a survey of industrial establishments was made. The first step was to list all industrial concerns in the city employing more than 40 persons. There were 428 separate establishments so listed. These were divided into classes or categories according to the type of manufacturing plant or product. Twenty-seven separate classes of industries were set up. By careful consideration of these types it was possible to pick out 17 classes of industry which might discharge industrial wastes other than of sanitary character. In order of importance these were meat packers, rubber products, rendering, tanneries, breweries and malt producers, dairies, laundries, several chemical or metal industries, and others of less importance.

Each concern, 234 in all, in these groups of industries with possible industrial wastes was visited by a field engineer who obtained pertinent information concerning operations and wastes produced. These data were set forth on forms prepared for the purpose with special forms for certain industries such as the packing plants, tanneries, breweries, creamers, etc. From these data, the industries contributing the greatest waste load were determined. Samples were taken in many plants typical of a group. Other plants were sampled for a period of time, still others had been sampled in the previous years during the design and construction of the treatment works. From an analysis of the samples, the concentrations of the wastes of these industries were determined.

It was ascertained that whereas the relation of concentration to volume was disproportionate in the case

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of milk wastes the quantity of these wastes was too small to be of any great burden on the treatment works. Other industries, too, appeared not to warrant any special consideration as to charges, but in the case of meat packing, tanning, and rubber reclaiming it appeared that the application of special treatment charges was warranted.

Although no case is known of the application by any other city of a general formula for special sewage treatment charges of the type here considered, there are however numerous instances reported in the literature, where industries do pay a proportionate share of the cost of operation of the treatment works because of their excessive waste load. This instance, however, appears to be the first where a formula has been proposed for application to all industries within a municipality.

Basis for Special Charges

The Buffalo sewage treatment works is operated for the purpose of disposing of sewage and wastes in such manner as to eliminate nuisance in the Niagara River. The work which constitutes this disposal includes pumping, disinfection by chlorination, removal of solids, and the disposal of solids by digestion, dewatering, and incineration. Costs of the operation may be allocated to overhead, pumping, treatment (including sedimentation, chlorination and sludge disposal), and maintenance and repairs. The principal items of treatment cost are the cost of chlorine and the cost of chemicals and power for the disposal of solids.

Every water user paying sewer rental charges on the basis of the volume of water discharged by him into the sewers, presumably pays his proportionate share of the overhead, pumping, maintenance and repair, and normal treatment costs at the sewage treatment works. Therefore, any additional charge for service because the strength of an industrial waste is in excess of the average strength of normal sewage should be only for the purpose of reimbursing the treatment works for the extra cost entailed in the treatment of such excess waste load. The extra cost can be definitely assigned to excess chlorine consumption and to excess chemicals and power used for the disposal of solids. The quantities of these materials required in excess of the normal sewage requirements can be ascertained for an individual waste by analyzing the waste to determine its chlorine demand and its suspended solids content.

Utilizing the above established principle that additional special charges should be based only on the extra cost of treatment of excess waste loads, the following considerations entered into the development of a general formula for the determination of such charges applicable to all industries. As indicated this formula should be based on the chlorine demand and suspended solids content of the particular waste, and on the cost of chlorine and on the cost of chemicals and power for the disposal of solids. The formula will, therefore, be such as to take cognizance of any change in the character of the waste discharged by any industry as well as of any change in the cost of operation of the treatment works. Consequently, periodic sampling and analyses of all wastes subject to special charges may be necessary to establish their average chlorine demand and suspended solids content. Finally, the formula should be such as to develop a rate of special charge which will be applicable to the volume of the wastes.

Derivation of General Formula

The approach to the derivation of the formula is given in the following steps.

1. Develop the formula to calculate special charge rate (R) in cents per volume unit of 1,000 cu. ft. of waste.

2. Assert the principle that water user is entitled, through payment of ordinary sewer rent, to concentrations of chlorine demand and suspended solids as normally present in sewage received at the treatment works, but that water user must pay for chlorine demand and suspended solids in his wastes above such normal concentrations. Therefore, introduce into the formula differences between concentrations of chlorine demand and suspended solids in the waste and concentrations of like substances normally present in sewage.

3. The difference between chlorine demand of waste and chlorine demand of normal sewage, reduced to pounds per 1,000 cu. ft. of waste by multiplying the concentration difference by a factor (F), is the excess chlorine demand per volume unit of waste for which the special charge should be made.

4. The difference between the amount of suspended solids in waste and suspended solids in normal sewage, reduced to pounds per 1,000 cu. ft. of waste by multiplying the concentration difference by factor (F), is the excess suspended solids per volume unit of waste for which the special charge should be made.

5. To obtain special charge rate (R), the pounds of excess chlorine demand per volume unit of waste is to be multiplied by the cost of chlorine per pound (Pc), and added to the pounds of suspended solids per volume of waste multiplied by the cost of disposing solids (Ps), i.e., cost of chemicals and power for chemical conditioning and incineration, exclusive of overhead.

6. The general formula applicable to all concerns and to all industries thus becomes:

$$R = FPc\ (C - Nc) + FPs\ (S - Ns)$$

Where R = rate of special charge in cents per 1,000 cu. ft. of volume of waste.

F = factor for converting parts per million to lbs. per 1,000 cu. ft.

Pc = contract price of chlorine in cents per lb.

C = concentration, in parts per million, of chlorine demand of the waste.

Nc = normal dry weather chlorine demand of raw sewage in parts per million of sewage as received at the treatment works.

Ps = cost in cents for chemicals used in sludge conditioning and for power for disposal of solids resulting from one lb. of suspended solids received in the raw sewage at the sewage treatment works.

S = concentration, in parts per million, of suspended solids of the waste.

Ns = normal grit-free suspended solids in parts per million of raw sewage as received at the treatment works.

The factor Pc may vary from year to year according to the contract price for chlorine and the factor Ps may vary according to the costs of chemicals and power involved in the disposal of solids as determined from operations for the previous year or previous two years. The factors C and S may be established by analyses (periodic or otherwise) to obtain average concentrations to be applied for any agreed length of period.

Determination of Values of Factors in Formula

1. Inasmuch as 1,000 cu. ft. equals 62,400 lb., one ppm. equals 0.0624 lb. per 1,000 cu. ft. Therefore, F = 0.0624.

2. The 1942-43 contract price of chlorine is $43.60 per ton or 2.18 cents per pound. Therefore, Pc = 2.18.

3. Concentration of chlorine demand (C) in ppm. in industrial waste is to be determined by standard methods of analysis.[1]

4. Chlorine demand of raw sew-

age or normal dry weather flow averages 5.6 ppm.[1] Therefore, Nc = 5.6.

5. Cost of disposing of solids is based on incoming grit-free suspended solids. Grit-free sewage contains none of the grit from streets washed by storms and represents approximately normal suspended sewage and waste solids as received at the treatment works. Treatment works studies at Buffalo indicate approximately 25 per cent of the total power consumption is for incineration operations. Buffalo data for years 1939-40 and 1940-41 were averaged to give representative basis for cost determination as follows:

Year	Sewage Flow M.G.D.	Grit-Free p.p.m.	Susp. Solids Lb./Yr.	Cost of Chemicals for Sludge Conditioning Per Year	Cost of 25% of Power Used Per Year
1939-40.....	135	157	.....	$21,160.66	$11,712.68
1940-41.....	140	158	.....	18,382.43	13,069.89
Average	137.5	157.5	65,923,700	19,771.54	12,391.28

Therefore, Ps =

$$\frac{\$19{,}771.54 + 12{,}391.28}{65{,}923{,}700} = \$0.000488 = .0488 \text{ cents}$$

6. Concentration of suspended solids (S) in ppm. in industrial waste is to be determined by standard methods of analysis.[1]

7. Suspended solids in grit-free sewage average 157 ppm. Therefore, Ns = 157.

When these factors for present costs and sewage concentrations are applied the general formula takes the following form:

$$R = 0.136\ (C - 5.6) + 0.00305\ (S - 157)$$

Thus it is seen that, in the application of the formula under present Buffalo conditions, the special charge rate per 1,000 cu. ft. of wastes would be 0.136 cents for each part per million of chlorine demand and 0.00305 cents for each part per million of suspended solids above the normal concentration of each in the raw sewage as received at the treatment works. It is to be especially noted that the industrial waste load is included in the normal concentration values of 5.6 ppm. for chlorine demand and 157 ppm. for suspended solids content of the sewage as received at the treatment works.

There may be special cases to consider in the application of the formula. Some industrial wastes may change characteristics when diluted with a relatively large volume of sewage. In such cases the total daily chlorine demand and suspended solids loads may decrease, or increase. The change may be shown by experimental tests on mixtures of the waste and sewage prepared in the ratio of their respective volumes.

Where experimental evidence shows the chlorine demand and suspended solids load to decrease or increase on dilution, the equivalent value or effective concentration of this decreased or increased load in ppm. concentration may be calculated for the original waste. Negotiation with the company concerned it may be agreed that the equivalent concentration of the waste is to be used in the formula for determining the special sewer rental rate. In cases of this kind, frequent analyses and experiment should be made to establish the validity of the concentration used.

Suggested Limits for Application of Special Charges

It does not appear economically feasible to apply a special charge when the rate is less than 1-cent per 1,000 cu. ft. of volume of waste. From considerations of the amount of work involved, it would also appear evident that it is not economically worth while to make special charges in any case where the total reimbursement does not cover by a considerable margin the cost of investigations and necessary bookkeeping.

On the basis of Buffalo's current costs, if suspended solids were not present in a waste, the concentration of chlorine demand would have to be 13 parts per million (2.3 times the present normal sewage value of 5.6 parts per million) to produce a special charge rate or R value of 1 cent per 1,000 cu. ft. Likewise, if chlorine demand were absent, the suspended solids content of a waste would have to be 485 p.p.m. (approximately 3 times the present normal sewage value of 157 p.p.m.) to produce a special charge rate or R value of 1 cent per 1,000 cu. ft. It is obvious that smaller concentrations of these items when in combination with each other will produce a value for R of 1 cent or more.

Summary

From the standpoint of feasibility of application and of effecting an equitable distribution of costs of treating excess waste loads, it has appeared possible to develop and apply a general formula for special rates of charge to any industrial plant whose waste load has a concentration measured in chlorine demand or suspended solids content of approximately three times that in the sewage as now received at the Buffalo treatment plant. This general formula is such as to permit adjustments of the special rates at periodic intervals accordingly as variations in the concentration of the waste received from an industrial concern or as variations may occur in the costs of treating such wastes.

It is proposed that the application of special rates of charge as developed from the general formula be made in the same manner as normal sewer rental charges, except that the special charges be separately billed. Under this procedure, periodic sampling and analysis of the wastes of the individual concerns may be necessary to maintain the rates of charge on an equitable basis. This will serve both as a protection to the interests of the Authority and to avoid penalizing an industrial plant which improves the character of its wastes. The choice of periodicity of sampling and the extent of sampling may be left to negotiation.

There appears to be no direct way in which a special rate of charge can be determined to cover the costs caused by the discharge of grease into the sewers. It has been recommended that provision be made to charge any concern for the cost of cleaning a sewer or sewers when the clogged condition of the same is directly attributable to the wastes discharged into the sewers by such concern. This provision should be broad enough to cover other materials which also tend to obstruct the sewers.

Whereas the formula herein described has been developed for application to the specific case of Buffalo, N. Y., where disposal consists of primary sewage treatment and disinfection with incineration of solids, there seems to be no reason why the same general type of forming could not be developed in any municipality for any type of sewage treatment and problem involved.

REFERENCES

(1) Standard Methods for the Examination of Water Sewage. 8th Ed.

(2) G. E. Symons, R. W. Simpson, & S. R. Kin, "Variations in the Chlorine Demand of Buffalo Sewage," Sewage Works Journal 13, 249-64 (1941).

The Editor's Comments

A Sound Sewerage Financing Scheme

AT this time of making plans in the water and sewage fields for post-war improvements, one of the most important questions raised is that of financing such improvements. Particularly is this the problem in connection with proposed sewerage betterments. In such instances it is the present feeling that the municipality with a sound public works project may possibly be offered Federal funds at a low rate of interest on a long term basis. At the present time, however, this possibility is purely speculative. And it is also true that municipalities can in many instances borrow money on the open market at rates less than those being paid by the Federal Government.

A number of states have passed enabling acts which permit municipalities to issue revenue type bonds for water or sewage works construction, the money for interest and retirement of the bonds to come from sales of water and/or collection of sewer service charges. The latter are based on volume of water taken by the sewer user, or some other form of sewer rental. A number of states, however, have no such enabling legislation and financing water and sewage works becomes more difficult.

Ohio has recently enacted history making legislation which offers what appears to be the simplest possible method of obtaining funds for constructing sewerage facilities, as well as for paying for their maintenance and operation, that has yet been developed. In W. R. La Due's article "Financing Sewage Works Improvements," featured in this issue, the new "Ohio Plan" is explained. The author, who has only recently taken over the Akron Sewerage System to operate jointly with the water works, which he has successfully managed for a number of years, can be credited with the vision and a large share of the successful effort in getting the legislation enacted.

In brief, what the new Ohio law says is this: If a municipality operates its water and sewerage utilities jointly under a common management it can utilize up to 10% of the net income (surplus) from water works operations for sewage works maintenance operation and/or construction of plant extensions or new works. The Ohio law gives, first, an assured safeguard to all water works surplus against possible diversion. While insuring that 5% is held for strictly water works needs the next 10% can be spent for sewerage needs, and anything above that first 15% operating profit can be eliminated through water rate reductions. What could be a more pleasing act in the mind of a water works manager, unless he be averse to the joint operation of water and sewerage systems.

Ohio has in addition a Revenue Bond Financing Act and a Sewer Rental Law, which may be employed in sewerage financing also, but with this new law those cities with water works systems operating at a profit may not need resort to the referendum required to issue Revenue Bonds or the adoption of Sewer Rental.

As we picture it the joint operation plan which enables combined and more flexible financing of the water and sewerage facilities of a community is basically sound and invitingly simple. We advocate consideration of this or a similar scheme by other states and municipalities of what seems to be the simplest possible method of paying the bill for the disposal of a community's "used water." And, what's more, it is an enviably painless method from all sides.

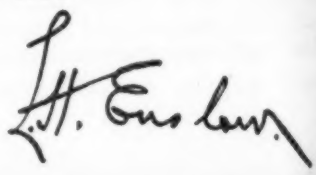
Short School History Made

JUST think of it—a registered attendance of 403 at a Water and Sewage Works Short School. This was the new record established last month by the Texas Short School, the proceedings of which are reported elsewhere in this issue. It was the 26th of these annual Texas Short Schools.

As far as we can determine Texas can claim the distinction of having the first and oldest Short School for Water and Sewage Works Operators. It was conceived and organized some 25 or 26 years ago by V. M. Ehlers, State Sanitary Engineer of Texas. Only about a year younger is the Ohio Conference on Water Purification, organized by F. H. Waring, Chief Engineer of the Ohio State Dept. of Health. However, it was run as a Conference rather than a School, while the Texas Short School was in every sense what the name implies. Plant superintendents and operators with absolutely no previous training in laboratory or purification methods were given A, B, C, courses in laboratory work as well as plant operation under the guidance of a "faculty" composed of chemists and bacteriologists from the larger Texas plants, college professors, City and State Health Dept. engineers, consulting chemists and specialists, such as research engineers and chemists connected with national trade associations and industry. The attendants at these Short Schools were graded and given certificates indicating the successful completion of courses, each year advancing to a higher grade (course) if successful in winning the lower certificate.

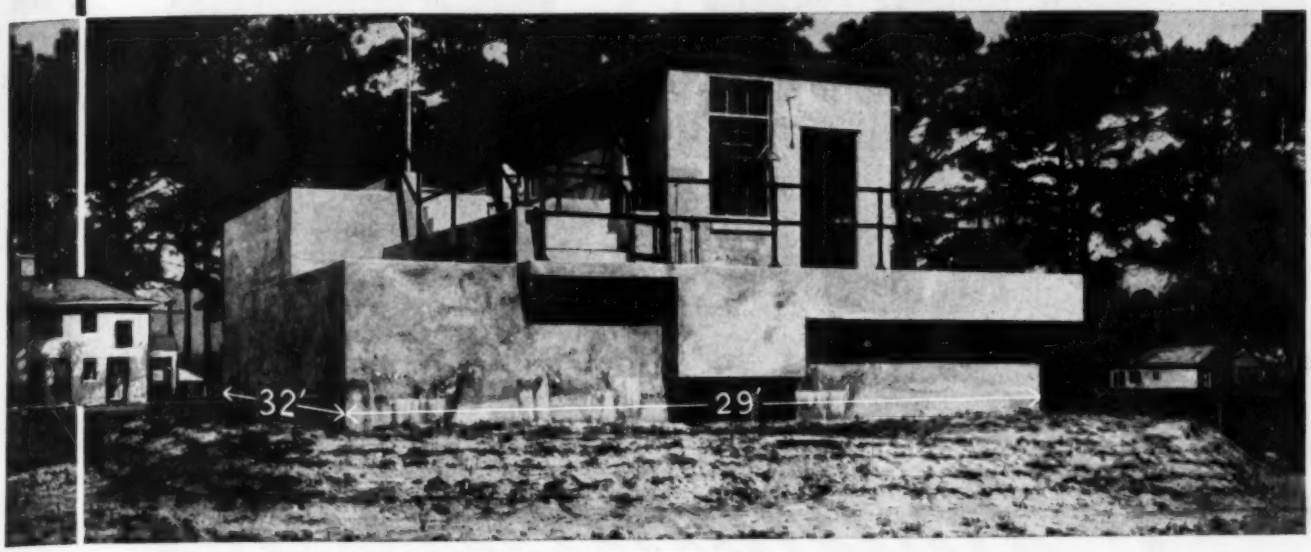
Prior to the writer's contacts with these Texas Short Schools (1926-1929) it would have been his idea that such an attempt to make laboratory technicians out of the run-of-mine plant superintendents would not alone have been largely a waste of effort, but actually a questionable undertaking, on the score that a little knowledge is frequently dangerous. However, it proved to be a case of "seeing is believing," because it soon was apparent that those taking the courses had come to the school to learn and not to play. Following up some of the "students" at home later it was almost unbelievable to see the things being accomplished by "short-schooled" operators in these plants throughout Texas. We saw plant engineers with hands that looked as if they couldn't even pick up a test tube, much less innoculate broth tubes, make bacterial plates, titrate alkalinity, making residual chlorine tests, performing other laboratory tests, recording the findings and regularly submitting reports to the State Dept. of Health. Yes the results were truly astonishing even in 1926 when the Short School could not boast more than 100 attendants if that number. In recent years these three-day schools have been held at A. & M. State College and the remarkable growth in attendance to the record this year of 403 makes the Texas Water and Sewage Works Operators' Short School something of which its founder can justly be proud.

Twenty-six years ago, "Vic" Ehlers, as State Sanitary Engineer, saw the potentialities when launching this pioneering enterprise, and all through these years has continued as the Short School's "Skipper," charting its course and watching his little bark of 1919 grow into the Leviathan of 1944.



A "FRONT YARD" PACKAGED SEWAGE TREATMENT PLANT

Specifically Developed for Populations of 100 to 3,000 . . . Not a Large Plant Scaled Down



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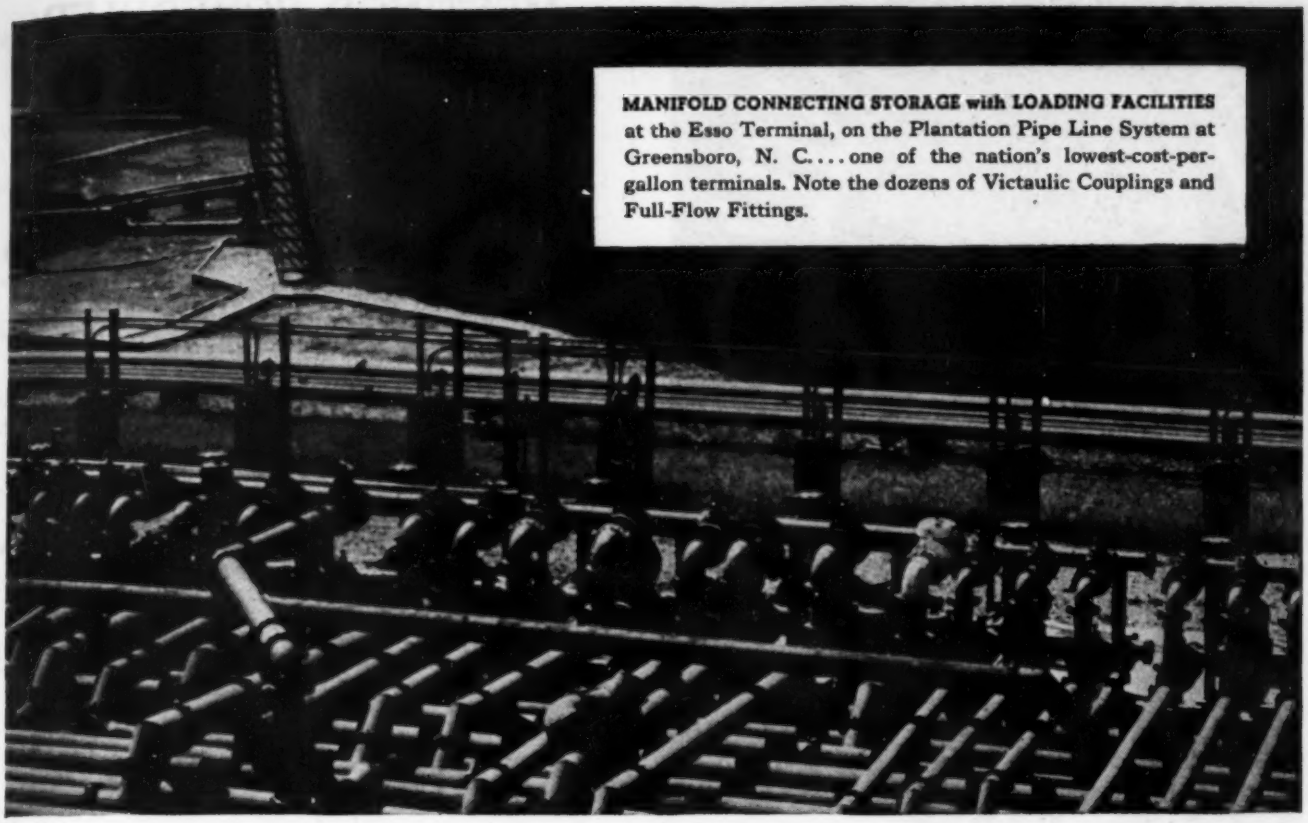

MANIFOLD CONNECTING STORAGE with LOADING FACILITIES at the Esso Terminal, on the Plantation Pipe Line System at Greensboro, N. C.... one of the nation's lowest-cost-per-gallon terminals. Note the dozens of Victaulic Couplings and Full-Flow Fittings.

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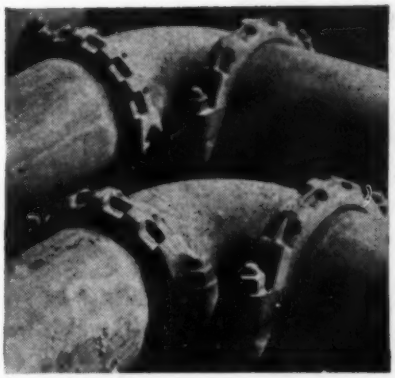

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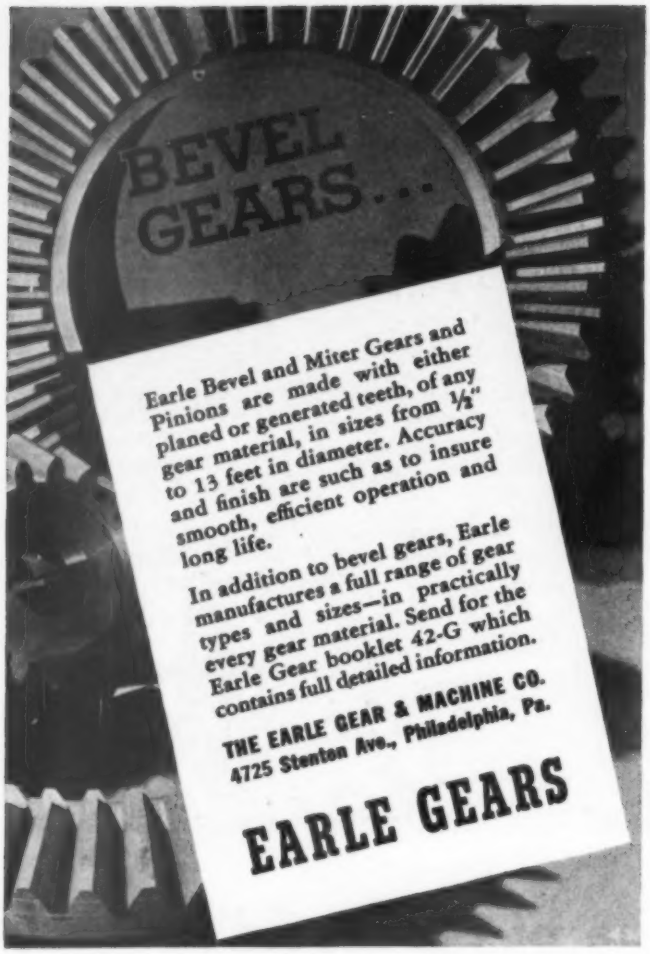
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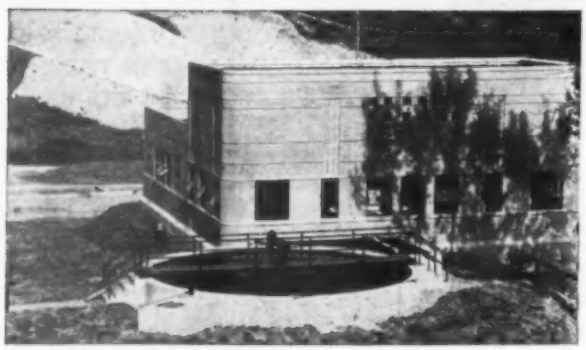

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MEETINGS SCHEDULED:

March 16—Boston, Mass. (Statler Hotel).
New England Section A.W.W.A. Sec'y, Samuel M. Ellsworth, 6 Beacon St., Boston, Mass.

March 16—Boston, Mass. (Hotel Statler).
New England Water Works Association. (Monthly Meeting.) Sec'y, F. J. Gifford, 613 Statler Bldg., Boston, Mass. (Next meeting April 20.)

March 16-17—St. Paul, Minn. (Lowry Hotel).
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, Wallace & Tiernan Co., 416 Flour Exchange, Minneapolis, Minn.

March 23-24—Trenton, N. J. (Stacy-Trent Hotel).
New Jersey Sewage Works Association. Treasurer & Acting Sec'y, Edward P. Molitor, Chatham, N. J.

April 5-6—East Lansing, Mich. (Michigan State College). **Michigan Sewage Works Association,** Secretary-Treas., R. J. Smith, State Department of Health, Lansing 4, Mich.

April 10-11—Clemson, S. C. (Clemson College).
South Carolina Water Works Association. Short School to be held at Clemson College.

April 11-13—Peoria, Ill. (Hotel Pere Marquette).
Illinois Section A.W.W.A. Sec'y, H. E. Hudson, Jr., 912 W. Charles St., Champaign, Ill.

April 12—Lewiston, Me.
Maine Water Utilities Association. Sec'y-Treas., Earle A. Tarr, Winthrop, Me.

April 13-14—Indianapolis, Ind. (Hotel Antlers).
Indiana Section A.W.W.A. Sec'y, Charles H. Beckert, State Library Bldg. 402, Indianapolis, Ind.

April 17-18—Little Rock, Ark. (Marion Hotel).
Arkansas Water & Sewage Conference. Sec'y, Harrison Hale, 114 Chemistry Bldg., Fayetteville, Ark.

April 19-21—Niagara Falls, Ont. (General Brock Hotel).
Canadian Section A.W.W.A. Sec'y, A. E. Berry, Ontario Department of Health, Parliament Bldg., Toronto, Ont., Can.

April 26-28—Jackson, Mich. (Otsego Hotel).
Michigan Section A.W.W.A. Sec'y, M. N. Gerardy, Detroit Dept. of Water, Detroit, Mich.

April 27-28—Utica, N. Y. (Hotel Utica).
New York Section A.W.W.A. (Spring Meeting.) Sec'y, R. K. Blanchard, Neptune Meter Co., 50 West 50th St., New York, N. Y.

May 5-6—Bozeman, Mont. (Hotel Baxter).
Montana Section A.W.W.A. Sec'y, H. B. Foote, Director, Div. Water & Sewage, State Board of Health, Helena, Mont.

May 8-10—GREENVILLE, S. C. (Poinsette Hotel).
Southeastern Section A.W.W.A. Sec'y-Treas., B. P. Rice, Healey Bldg., Atlanta 3, Ga.

May 11—TRENTON, N. J. (Hotel not selected).
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Dist. Mgr., Wallace & Tiernan, Inc., Box 178, Newark, N. J.

May 19-20—BALTIMORE, MD. (Lord Baltimore Hotel).
Maryland-Delaware Water & Sewerage Association. Sec'y-Treas., E. V. Gipe, 2411 N. Charles St., Baltimore, Md.

May 12-13—OLYMPIA, WASH. (Olympian Hotel).
Pacific Northwest Section A.W.W.A. Sec'y, Wm. P. Hughes, City Engr. & Water Supt., City Hall, Lewiston, Idaho.

May 17—SPRINGFIELD, MASS. (Hotel Kimball).
New England Sewage Works Association. (Spring Meeting.) Sec'y, LeRoy W. VanKleeck, State Dept. of Health, Hartford, Conn.

May 18-19—COLUMBUS, OHIO (Hotels Fort Hayes & Chittenden).
Ohio Section A.W.W.A, Sec'y-Treas., L. J. Hoffman, City Water Works, 100 Municipal Bldg., Akron, Ohio.

June 13-16—MILWAUKEE, WIS. (Hotel Schroeder).
American Water Works Association (1944 Wartime Conference and Annual Meeting.) Executive Secretary, Harry E. Jordan, 500 Fifth Avenue, New York, N. Y.

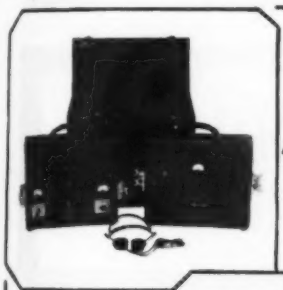
June 14—KENNEBUNK, ME.
Maine Water Works Association. (Regular Meeting.) Sec'y-Treas., Earle A. Tarr, Winthrop, Me.

June 16-17—SYRACUSE, N. Y. (Hotel Syracuse).
N. Y. State Sewage Works Association. Sec'y, A. S. Bedell, N. Y. State Dept. of Health, Albany, N. Y.

Oct. 12-14—PITTSBURGH, PA. (Hotel William Penn).
Federation of Sewage Works Associations, Exec. Sec'y, W. H. Wisely, Illinois Building, Champaign, Ill.

Oct. 17-19—AUSTIN, TEXAS (Stephen F. Austin & Driskill Hotels).
Southwest Section A.W.W.A. Sec'y-Treas., George J. Rohan, P. O. Dr. 449, Waco, Texas.

Nov. 2-4—ATLANTIC CITY, N. J.
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Dist. Mgr., Wallace & Tiernan, Inc., Box 178, Newark, N. J.



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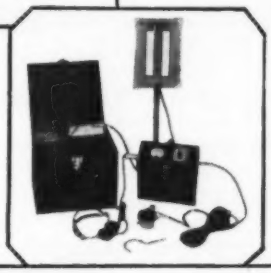

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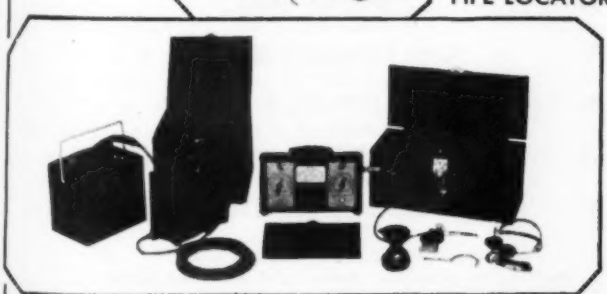

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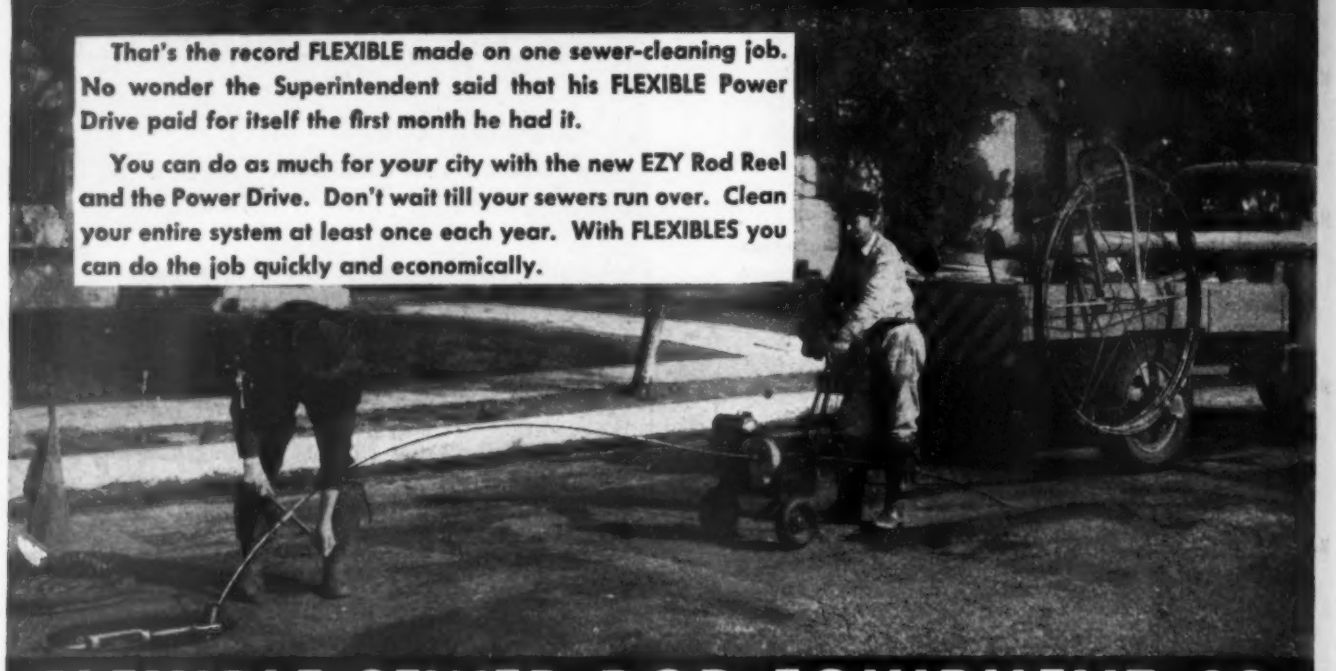

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Here and There with Doc Symons

AT THE WAR session of the Northwestern Ohio Conference on Sewage Treatment at Findlay, Ohio, last October; we weren't there but we read that Ben Barton gave a paper on the Findlay plant, in which he said, "Adjusted aeration (Findlay claims coinage of the term) is practiced at the Findlay Treatment Works when the flow is 75 per cent of normal expectancy. This process consists of increasing hydraulic head on one unit of aeration, thus diverting a larger portion of the air to the active tank. The inactive tank is thus aerated for a longer period of time and goes back into service in a much healthier condition, capable of coping with shock loads. The two units are alternately used in this manner."

* * *

Two postcards came in the last month. The first, from Maj. Charles C. Agar, contained this information, No. 0442415, Med. Sec., 3rd Army Hq., A. P. O. 403, care Postmaster, New York, N. Y. Those cryptic notations must have meant that Charlie, one time Sr. San. Engr. of the N. Y. State Dept. of Health, is now outside the continental U. S. Wonder if he was on that huge convoy which recently reached England? The second card came from Maj. Tom Riddick, USPHS(R), now located in New Orleans, "America's Most Interesting City." Until recently Tom has been in the 2nd Service Command working in New Jersey; his consulting engineering and chemical laboratory practice is being carried on by Lee T. Purcell, Analyst, No. Jersey Dist. Water Comm., Wanaque, N. J.

* * *

Only last month we mentioned having learned about writing obituary columns and within a week after we wrote that another stalwart of the profession was gone. We didn't write Paul Hansen's obituary but we felt we could have. We first

Royer Sewage Sludge Disintegrator Model "NSC-4" at City of Palo Alto, Calif.

SLUDGE DISPOSAL— an Expense or a Source of Profit?

When sewage sludge is buried or incinerated, an unnecessary expense is incurred.

When a marketable fertilizer is made from the sludge—which can readily be done — profitable revenue is received by the sewage works and the cost of sludge disposal is eliminated.

Moreover, the fertilizer obtained from sewage sludge increases food production; a vital matter with ever-growing millions overseas looking to America for their food.

With a Royer Sludge Disintegrator and less labor than is required to burn or bury it, sludge is converted into a ready-to-use fertilizer. The operator shovels the sludge cake into the convenient hopper of the machine, which does the rest of the job.

The Royer shreds, mixes, aerates and further dries the sludge; reducing it to pea size and discharging onto pile or truck. Sticks, stones and trash are automatically removed. By using the Royer to mix chemicals with the sludge, a high strength fertilizer can be produced.

In cities large and small, sewage treatment plants with Royers are receiving worthwhile revenues from fertilizer sales and at the same time boosting America's food production. In other cities, Royers have lowered park maintenance costs by supplying Royer-ized sludge for lawn top dressing. Write for the "Sewage Sludge Utilization Datalog."

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ASK THE GANGS THAT RUN 'EM - THESE NEW DEAN GATE OPERATORS.

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*Abington, Mass.	1	Newark, N. J.	2
Atlanta, Ga.	1	New York, N. Y.	12
Baltimore, Md.	1	Brooklyn, N. Y.	5
Boston, Mass	2	Bronx, N. Y.	5
Buffalo, N. Y.	4	Queens, N. Y.	5
Clarksburg, W. Va.	1	Richmond, N. Y.	5
Cleveland, Ohio	4	Oakland, Cal.	1
East Orange, N. J.	1	Paterson, N. J.	1
Fitchburg, Mass.	1	Pawtucket, R. I.	1
*Greenfield, Mass.	1	Providence, R. I.	5
Hackensack, N. J.	1	*Holyoke, Mass.	1
Hartford, Conn.	1	*Louisville, Ky.	1
Honolulu, T. H.	1	Seattle, Wash.	2
Kansas City, Mo.	1	*Shreveport, La.	1
Kenosha, Wis.	1	Sioux Falls, S. D.	1
Montclair, N. J.	1	Springfield, Mass.	1
New Bedford, Mass.	1	Spokane, Wash.	2
Tampa, Fla.	1	Washington, D. C.	4
Waterbury, Conn.	1	Wichita Falls, Tex.	1

*On order.

10 minutes of rest

One hour of toil

WHICH MAKES SENSE?

PAYNE DEAN & COMPANY - Laconia, N. H.

met Mr. Hansen at the Illinois State Water Survey when we were 11 years old. While he talked to our father, we sat on his desk and played with paper clips. We met him 11 years later when we worked for Dr. Hatfield in Decatur, and again when we were on the Water Survey Staff. We met him again when we worked for him in Evansville, Ind., on the sewerage project. It was Paul Hansen who suggested that we go to Buffalo for six months to head up an experimental laboratory during the design period of the sewage treatment works. We went, we worked with Paul Hansen, we stayed on for seven years. We sought his advice on many occasions. We are among those who will miss him.

* * *

In India, besides water peddlers, our soldiers also see odd advertisements. In the January 1944 issue of *Cast Iron News* appears reproductions of two advertisements from an Indian newspaper. Here in this country we call attention to all the scientific values of our manufactured products, but in India the toughness of cast iron pipe is emphasized by comparing it to the rhinoceros' tough hide, and its long life is compared to that of the tortoise.

* * *

Another of our valued contributors has donned the khaki, he being R. S. Phillips, Chief Chemist of the Durham, N. C., Water Dept. and Secy.-Treas. of the No. Car. Sect., AWWA, now a 1st Lt. at Carlisle Barracks, Pa.

* * *

Bumped into Johnny Horgan and Jack Van Atta of the Ralph B. Carter Co. at the NYSSWA meeting and they took time out to tell us they hope to release soon a catalog showing that the Carter Co. is and will be manufacturing a complete line of water and sewage treatment equipment, including clarifiers, rotary distributors, alternating syphons, aerators, as well as plunger sludge pumps. Even the manufacturers are Blueprinting now!

* * *

Fifteen hundred years of experience is a long time in a water utility, but that was what the 117 persons attending the Maine Water Utility Assoc. luncheon in Portland had all together. Oldest in point of years of service to the water works field was Joe Lufkin of the Red Hed Mfg. Co., with 57 years to his credit. For this distinguished record Mr. Lufkin received a free meal, as did two other old-timers.

* * *

At the recent meetings of ASCE, AWWA, and NYSSWA in New York we were handed a slip of paper saying, "At bridge last night the only loser was Mike Glace of Harrisburg." Is that news?

* * *

Niagara University, N. Y., is unique; it is both a university and a U. S. post office. Niagara University also has a professor, Dr. Warren K. Eglof, who for the past several years has been giving a course in sanitary engineering chemistry to qualify men for Grade II and Grade I operators' certificates in the State of New York. We have been guest lecturer in his course, have sat in committee meetings with him, know the high regard in which he is held, and think he knows his stuff about sanitary chemistry and the like. Prof. Eglof writes that the army program is being withdrawn from the university and his contract obligations are ceasing. That means he is, or soon will be, available for teaching, operating a plant, or directing research on sanitary engineering problems for some organization that needs a good man.

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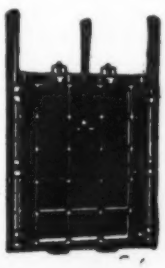

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118 Lake St., Orange, Mass., U. S. A.

Corn Dept.—Seems as though former staff men of the Illinois State Water Survey at Urbana, Ill., lean to the "Corny." There is Dr. R. E. Greenfield, Director of Research at the Staley Starch Works, Decatur, Ill. He makes starch out of corn. . . . There is Dr. W. D. Hatfield, Supt. of the Sanitary District of Decatur, Ill. He makes gas out of corn-product wastes. . . . There is Dr. F. W. Mohlman, Director of Laboratories of the Sanitary Dist. of Chicago. He also has made something out of corn-product wastes. . . . There is Dr. C. S. Boruff, Technical Director of Hiram Walker & Sons, Peoria, Ill. He makes whiskey out of corn. . . . And now comes word that Dr. A. L. Elder, formerly WPB Coordinator for Penicillin, has just been made Director of Research of the Corn Products Co., Argo, Ill., where he too will make starch out of corn. . . . But apparently only one Doctor from the Water Survey (we) makes "corn" out of a typewriter.

* * *

The New Jersey Sect. meeting early in Feb. at Newark brought forth something new in the way of a question and answer program. George Norcom, new V. P., was introduced as the leader of the session by A. F. Eschenfelder, who said, "I now give you Mr. George D. (for Dunninger) Norcom, who will read the questions and then read your minds to see who knows the answers."

Well, darned if it didn't seem like he was doing just that; for, after reading the question at hand and calling on an individual, without exception he obtained an excellent answer. *But* the truth came out when one of the "picked experts" said, "That's my question." Seems as though "Dunninger" Norcom had the name of the questioner on each card, and whenever some questioner had asked a question that he should be able to answer, our thought penetrating wizard promptly called on that questioner. It was more than amusement though, for the questions were serious, well-timed, and the answers full of meat and information. The "meat" no doubt was intended to take the place of that not available for the luncheon.

* * *

We were shocked to hear recently of the death of Herman D. Hutcheson, Supt. of the Newark, N. Y. (not N. J.) Sewage Disposal plant. "Hutch," as he was known to most of us in Western N. Y., died suddenly while working at the disposal plant. A coroner's inquest was ordered to determine if he could have

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A Size and Type to Fit Your Problem In Water or Sewage Treatment.

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Symbol of Quality Since 1889

You Can Make a Branch Connection Without Stopping Service

If increased demands for water, due to the National War effort, make it necessary for you to plan new extensions to your existing pipe lines, you can make the necessary branch connection with a

SMITH TAPPING MACHINE

without interrupting the continuous flow of vital water to other points on the same line. These machines are made to make taps from 2 inches to 42 inches. They are easy to handle and economical to use and are the most reliable machine for the purpose made.

The larger machines are for rent and we supply supervision in their use. The smaller ones may be bought or rented.

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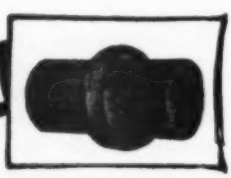

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- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON **Adams, Mass.**

died from the effects of sludge digestion tank gas. We shall always remember "Hutch" as an operator who calmly boasted that he obtained more than 2 cu. ft. of gas per capita while many plants struggle to get one, if that much.

* * *

Well, the Fourth War Loan Drive is over. But the war isn't, and the Red Cross Drive this month merits your help.

MANUFACTURERS' *and* EQUIPMENT News

Neptune Offers Improved Rate Indicator for Meter Testing

An improved rate indicator which can be attached to any test bench to enable the operator to regulate accurately flow rates in meter testing is being offered by Neptune Meter Co.

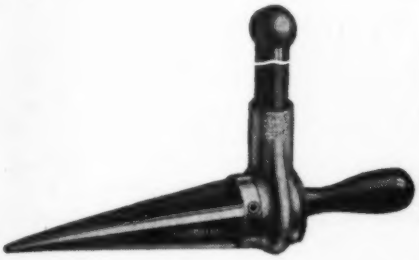
In the standard unit, streams may be regulated to four different rates of flow—¼, ½, ¾ and 1 gal. per min.—by setting a circular plate to one of four clearly marked positions. In each of these positions a calibrated orifice is brought into position and by maintaining the water level at the point indicated by markers on the sides of the glass tube (see cut) a constant head is maintained. This

will indicate that the desired *rate* of flow is being delivered, an important consideration in all meter testing. In short, this manually set rate-indicator makes it possible for the operator to regulate the test flow accurately to any predetermined rate of flow. Any variation from that rate of flow will immediately become observable in the rate indicator.

For further details address the Neptune Water Co., 50 W. 50th St., New York City.

New Long-Taper Pipe Reamer

A new pipe reamer of extra long taper design has been added to the well known line of RIDGID pipe tools by The Ridge Tool Co. of Elyria, O. As a result of the long taper, this improved reamer is claimed not only to avoid flaring, splitting, or reducing wall of pipe, but to remove the burr unusually cleanly and easily



from the inside of pipe or conduit. It is furnished with ratchet handle, or can be used with the ratchet handle of RIDGID No. OOR Ratchet Threader.

For literature describing this and the numerous other pipe tools, wrenches, etc., write the Ridge Tool Co., Elyria, Ohio.

Mascot Vest-Pocket Slide Rule

The MASCOT Slide Rule was created to fill a requirement of long standing; it can be carried in the vest pocket, is unbreakable, and accurate under roughest handling. Grease and water-proof, with fine black graduations on white celluloid, it is easily readable and can be washed when soiled. The Mascot Slide Rule will solve any problem in multiplication, division and proportion and being circular the answer is never off the scale. "Trig" scales give sines and tangents of numbers. Priced at $1.00 in fabrikoid case, or $1.25 in leather case, the Mascot is

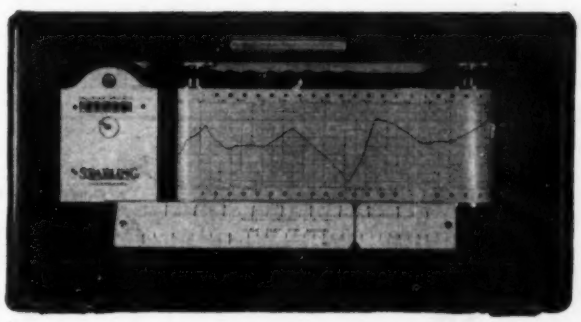
SPARLING MAIN-LINE METERS

The filtration and softening plant of the Metropolitan Water District of Southern California is equipped to handle 100 MGD and is designed to expand to 400 MGD. Sparling Meters measure the inflow from the Aqueduct to the plant, where Chlorination is controlled by the meters. Thirteen other Sparlings are used on wash-water lines and on the brine line in the zeolite regeneration process.

Fifteen Gallons a Minute or Four Hundred Million a Day

Accurate water production records make for economical operation in small plants as well as large ones. The cost of Sparling Meters is nothing compared to the necessary job they do.

For as little as $75 you can install a complete Totalizing unit on a 2-inch main line. A flanged Sparling Meter for a 6-inch line lists at $250. And some of the biggest water works jobs in the country are Sparling metered.



A comprehensive line of Indicators, Recorders and Controls is available for use with Sparling Meters. There is one to suit your needs.

Bulletin 308 comes at your request.

SPARLING *Manufacturer of Water Measuring Equipment*

LOS ANGELES 54. Box 3277, Terminal Annex — 622 Broadway.....CINCINNATI 2
CHICAGO 16.....3104 South Michigan Ave. — 101 Park Avenue.....NEW YORK 17
BOSTON 8.....6 Beacon Street

ANTHRAFILT
A Filter Medium For All Purposes
ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York
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ZECO GREENSAND ZEOLITE
ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.
ZEOLITE CHEMICAL CO.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

75 Federal St., Boston

Motor Operated Gate Valve

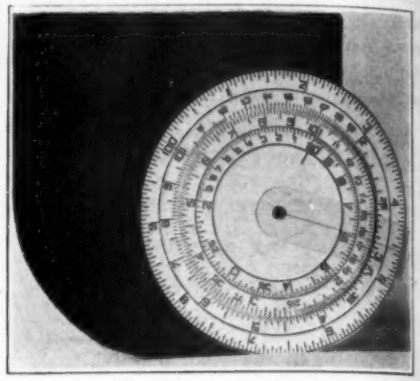
SAVE MANPOWER!

The need for conserving manpower is currently stressed due to war-time conditions. This has influenced the use of motor operated valves on many war projects.

After the war, you may find it well worth-while to consider using these valves in your water plant where frequent operation is necessary.

RENSSELAER VALVE CO., Troy, N. Y.

sold on a money-back offer any time within 30 days if not satisfied. A companion rule, known as the Monitor, is six inches in diameter of white vinylite, and sells for $2.95,



plus 75 cents for leatherette case if desired.

Either of these rules may be obtained from the Tavella Sales Co., 25 West Broadway, New York 7, N. Y.

Rota-Sight Flow Rate Alarm

Fischer and Porter Co., Hatboro, Pa., have developed a new Rota-Sight Flow Rate Alarm which operates in connection with Rota-Sight Flow Rate Meter equipment.

The Rota-Sight Alarm operates through a float which moves up and down a Pyrex tube through which triangular flutes have been fash-

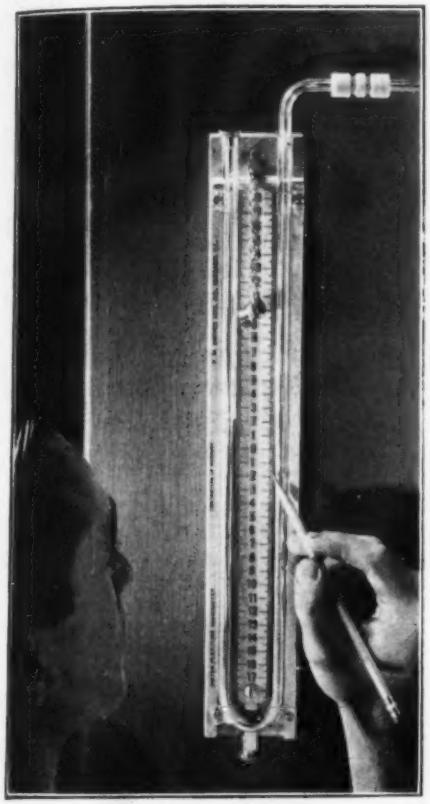
ioned. As the float rises, the area within the flute increases, causing the float to assume a position in the tube in direct proportion to the flow rate. A magnetic extension on the float trips an external switch to operate an alarm circuit. The alarm flow point is adjustable over the entire flow range and operates accurately at the set position. The oper-

ation of the alarm may save valuable or critical equipment that can be ruined by failure of a cooling or lubricating flow.

The Rota-Sight Alarm is used for flows of water, lubricating oils, filter feeds, overflows, chemicals, etc. Built in sizes up to 2½ in., it may be obtained in any corrosion resistant metal that can be cast. Bulletin 92-B with full description will be sent upon request to Fischer and Porter Co., 954 County Line Road, Hatboro, Pa.

Shatterproof Manometers

Meeting a demand for unbreakable gages, portable or stationary, the F. W. Dwyer Mfg. Co. of Chicago have used shatterproof Tenite, a



plastic tubing of cellulose acetate butyrate made by Tennessee Eastman Corp. and extruded by Sandee Mfg. Co. of Chicago. Tenite tubing is seamless, easily bent, and has ends threaded for screw caps. Oil, water, or mercury may be used as the fluid. For information write F. W. Dwyer Mfg. Co., Chicago, Ill.

"Dan" McAfee Resigns from Dorr

Announcement has been received that D. S. McAfee, Vice President and a Director of the Dorr Co., has arranged to terminate his association with the company. Mr. McAfee has for several years specialized in

The Mark of Quality

TC TENNESSEE CORPORATION

TENNESSEE CORPORATION Ferri-Floc FERRIC SULPHATE

IN THE THEATRES OF WAR PRODUCTION . . .

FERRI-FLOC

Saves Money *Saves Man Hours*

Through the efficient part it plays in the manufacture of:

Shell-Casings
Foam Fire-Fighters for use aboard ships
Synthetic Rubber
Insulating Board for ships and barracks
Mineral Pigments for paint and camouflage

Through its important role in:

Boiler Feed-Water Treatment in War Plants
Water Purification in Army, Naval and Air Bases
Sewage Treatment in Army, Naval and Air Bases

Yet to all users on the HOME-FRONT, FERRI-FLOC is still available without priorities.

Write for Actual Case Histories

We salute Tennessee Copper Company, source of our raw materials, for their untiring efforts which have permitted our other plants to carry on at full capacity; and we share their pride in their recent award of the Army and Navy E.

ARMY E NAVY

Tennessee Corporation

ATLANTA, GEORGIA LOCKLAND, OHIO

EDSON
DIAPHRAGM PUMPS

Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
Open Discharge or Force Pump
Edson Special Suction Hose
Red Seal Diaphragms
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Main Office and Works: 49 D St. South Boston, Mass.
New York: 142 Ashland Pl., Brooklyn

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JOINT LEAKAGE
WITH
CARSON CLAMPS
AND MECHANICAL JOINTS

Charcoal iron bolts for Cast Iron Pipe and Fittings.
Write for Prices.

Carson-Cadillac Co.
1221 PINSON ST. BIRMINGHAM, ALA.

TELL US NOW

We'll Be Ready with ENOUGH and ON TIME!

NOW is the time for a seasonal check-up of your water works requirements. Although a large part of our facilities are being used to produce specialized items for the Army, Navy, and Air Corps, we are manufacturing a full line of Water Works Products, subject of course, to W.P.B. approval.

We suggest that you be conservative in your estimates, but get your orders in as quickly as possible. We will be ready with enough and on time.

HAYS MANUFACTURING CO • ERIE • PA.

WATER WORKS PRODUCTS

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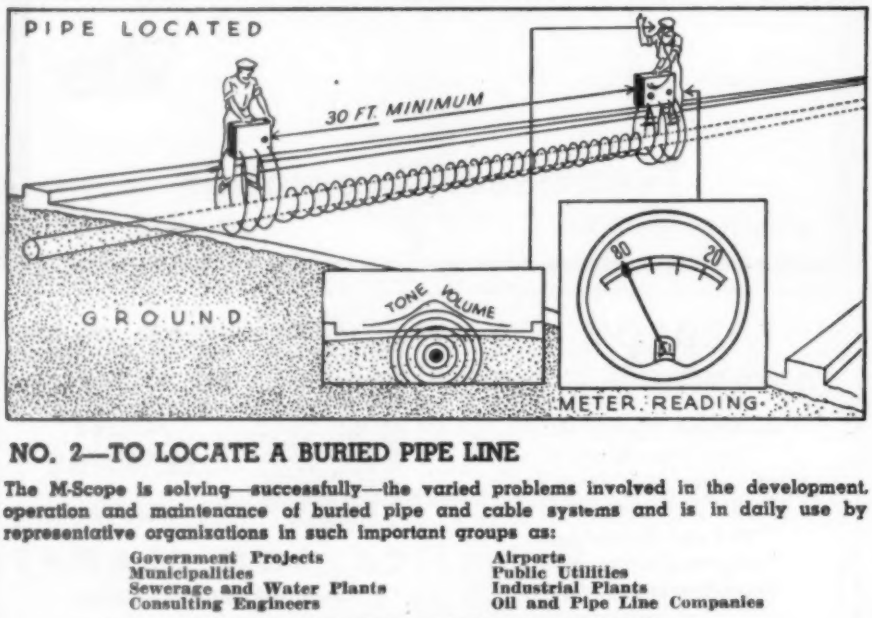
★ Invest in Bonds today to provide for extensions tomorrow ★ ★ ★

M-SCOPE

BURIED PIPE AND CABLE FINDER

WILL LOCATE NONMETALLIC SEWER LINES



NO. 2—TO LOCATE A BURIED PIPE LINE

The M-Scope is solving—successfully—the varied problems involved in the development, operation and maintenance of buried pipe and cable systems and is in daily use by representative organizations in such important groups as:

Government Projects
Municipalities
Sewerage and Water Plants
Consulting Engineers
Airports
Public Utilities
Industrial Plants
Oil and Pipe Line Companies

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equipment and methods for the process industries, including metallurgical, chemical, industrial, and sanitary engineering.

In addition to work on the North American continent, Mr. McAfee's

D. S. McAfee

activity has involved directing work for and traveling in Chile, Peru, Brazil, Argentine, Paraguay, and other South American countries; as well as Europe, the Philippines, Japan, and parts of China.

Mr. McAfee is well known in the water and sewerage field, having been president of the Water and Sewage Works Mfg. Assoc. in 1943. Mr. McAfee has not announced any plans for the future.

John McKague of Pittsburgh-National Dies

John J. McKague, long time National Meter salesman, died on February 16, 1944.

Mr. McKague spent his entire business career with the same organization, starting as a young man in the office. Since 1917 he covered the

John McKague

Eastern Seaboard until the illness of several months' duration which preceded his death. He had completed 40 years of service on February 13, 1944.

Mr. McKague was a member of the Elks Club and 4th Degree Knight of Columbus.

John McKague had a host of friends who will be sorrowed to learn of his passing. He was a sober and industrious gentleman who believed

in his product and the company behind it; made many friends for both and kept them. He attended water works meetings religiously and will be missed by many.

Amer. Wells Works Appoint N. Y. Dist. Rep.

Mr. L. H. Chamberlain, Eastern Manager for the American Well Works, Aurora, Ill., has announced the appointment of Marc B. Crowley as Manager of the New York District, which covers New York State to Albany and New Jersey as far south as Trenton. Mr. Crowley will be located at 475 Fifth Ave., New York City.

Penn Salt Moves New York Office

Pennsylvania Salt Manufacturing Co. has moved its New York office to 40 West 40th Street, New York 18, N. Y. The New York office is the headquarters of two of the company's sales districts, one headed by F. G. Rodenburgh and the other by C. A. McCloskey.

New Bailey Meter Managers

Bailey Meter Co., Cleveland, has announced the appointment of N. M. Barnett as manager of the Chicago Branch Office to succeed M. Greenberg, who resigned Feb. 1. Mr. Barnett is a mechanical engineering

N. M. Barnett

R. T. Cowan

graduate from the Univ. of Kentucky, and has been with the company for over twenty years, having been manager in Detroit until his transfer.

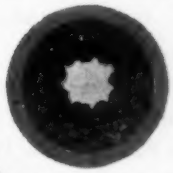
The vacancy in the Detroit Branch office created by the transfer of Mr. Barnett has been filled by the appointment of Ralph T. Cowan, formerly of the Detroit and Cleveland Sales Offices. Mr. Cowan is a graduate of the Case School of Applied Science and has specialized in applying metering and automatic control equipment to power plants and industrial processes.

MORE WATER
—LESS WORRY

by CLEANING your WATER MAINS
using The NATIONAL METHOD

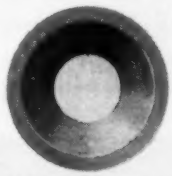
No need to worry about reduced water main capacities just when you need every gallon you can pump. Do as many other communities—large and small—are doing; clean those old clogged up mains by using the NATIONAL METHOD of water main cleaning.

We offer you (1) greater volume of water; (2) lower pumping costs; (3) improved pressure; (4) cleaner water and (5) reduced insurance rates.



Before Cleaning

The NATIONAL METHOD



After Cleaning

GUARANTEED TO RESTORE
95% ORIGINAL CAPACITY

The National Water Main Cleaning Co.
30 Church St. New York 7

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3812 Castellar St., Omaha 5, Neb.
P. O. Box 683, Jacksonville 1, Fla.
205 West Wacker Dr., Chicago 6, Ill.
501 Howard St., San Francisco, Calif.
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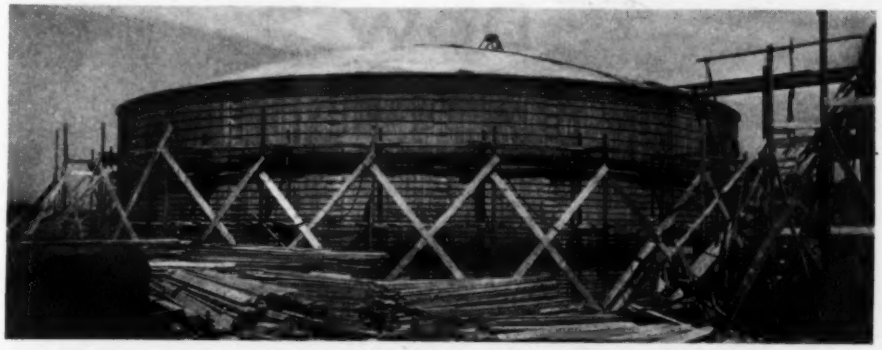
576 Wall St., Winnipeg, Can.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



NEW "GUNITE" WATER SUPPLY TANKS

Shown above is one of two water supply tanks built by us, under direction of the noted Consulting Engineer, Mr. I. M. Glace, for the borough of Schuylkill Haven, Pa. The tanks are 80'-0" dia. x 20'-0" high with walls 8" thick and self-supporting domed roof, both built of reinforced "GUNITE." The tanks are built upon thick poured concrete slabs, and have a capacity of 750,000 gal. each. A unique feature is that half the capacity of each tank is always at the disposal of a large local industrial plant, while the balance is for community use. This is assured by the simple expedient of having the taps for the latter purpose halfway up the tanks.

See our Bulletin 2200 for other water works jobs we have done in "GUNITE," as well as many other kinds of work.

MANUFACTURERS OF THE "CEMENT GUN"

THE *Bailey Synchro-Meter* GIVES YOU *Flexibility* IN METERING APPLICATIONS

● This meter panel includes both direct mechanically operated Fluid Meters and Bailey Synchro-Meters, which are electrically operated by remote transmitters.

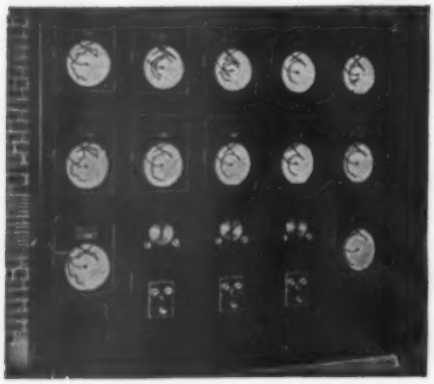
Wherever you have need for a central meter panel incorporating both mechanically and electrically operated Fluid Meters, it is possible to maintain uniformity and neatness by employing this system of transmitting meter and recorder readings.

Readings of flow, pressure, temperature, liquid level and other factors are accurately and quickly transmitted from out-of-the-way places to the receiving indicator, recorder or integrator by the Bailey Synchro-Meter.

This electrical mechanism which is completely described and illustrated in Bulletin No. 194-A, can also be used to eliminate the necessity of running high pressure piping up to meter and control panels.

Write for your copy of this new Bulletin.

MU-11



BAILEY METER • COMPANY •

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BAILEY METER COMPANY LTD., MONTREAL

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FERRIC CHLORIDE

SOLUTION

35-47%

shipped in tank cars

60% CRYSTALS

packed in 300 or 500 lb. barrels

● FOR SLUDGE CONDITIONING
● SEWAGE COAGULATION
● WATER PURIFICATION

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

James H. McMahon, Chlorine Pioneer, Dies

James H. McMahon, 83, a pioneer in introducing the use of American-made bleaching powder, and later liquid chlorine into paper pulp bleaching, died at his home in Buffalo last month. He was intimately connected with the early development of chemical manufacturing in the United States, being for nearly 40 years connected with the Mathieson Alkali Works.

After early work with the electrolytic production of caustic soda and chlorine at Niagara Falls, Mr. McMahon became manager of the Mathieson plant at Saltville, Va., in 1918. He held this post until 1921 when he was made technical representative of the company with headquarters at Niagara Falls, and was placed in charge of development work. He remained with the company in this capacity until his retirement from active service in 1935.

W. O. Wilson, Worthington Vice-Pres.

Appointment of W. O. Wilson, Evanston, Ill., as Commercial Vice-president of Worthington Pump and Machinery Co., has been announced. He has served as district manager for Worthington in the Pittsburgh and Chicago districts.

In his new capacity Mr. Wilson will be responsible for general supervision of commercial activities in the Chicago, St. Louis, Kansas City and St. Paul District Office Territories, with headquarters in Chicago.

Mr. Wilson has been with Worthington or its predecessors since 1898, except for two years when he was construction engineer for American Water Works and Electric Co.

Nichols Purchases Amersil

C. W. Nichols, Jr., President of Nichols Engineering and Research Corporation, New York, has announced the purchase by that corporation of the Amersil Company, Inc., Hillside, N. J.

The Amersil Company, Inc., well known manufacturers of American Fused Silica and Quartz Products widely used in the chemical industry of this country, will move their general offices to 60 Wall Tower, New York. Manufacture of the line of silica and quartz products will continue as at present in the plant at Hillside.

In order to facilitate and simplify

• ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES •

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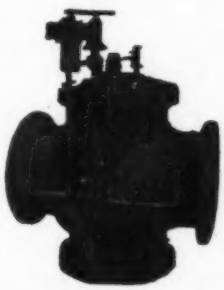
ROSS
AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

FLOAT VALVES • REDUCING AND REGULATING VALVES

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

the work of the two companies, the Amersil Co. will be operated as a Division of the Nichols Engineering and Research Corporation.

Wailes Dove-Hermiston New Plant at Houston

Wailes Dove-Hermiston Corp. is constructing a new plant at Houston, Tex., to supply the Southwest area with their products. The new plant will be located at 7002 Clinton Drive, Houston, and will stock Bitumastic Enamels and Bitumastic Industrial Coatings in complete line. The first shipments from this plant will be made for the protection of the Tennessee Gas & Transmission Co. pipe line from Corpus Christi, Tex., to Kenova, W. Va.

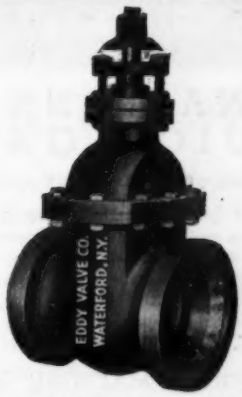
LITERATURE AND CATALOGS

The Dorrco Vacuator is presented in a four page leaflet just off the press. This unit is developed primarily for the removal of grease and light, difficult-to-settle solids from sewage and trade waste prior to clarification. The leaflet describes the principles of operation, what the vacuator is and how it works, the types and sizes available, the fields of application and the advantages of the equipment. The leaflet on the Dorrco Vacuator may be obtained by writing the Dorr Co., 570 Lexington Ave., New York 22, N. Y.

The Yeomans Guard for January-February contains an article on a Yeomans Expelsor sewage pumping unit being installed aboard Army and Navy vessels; another on providing adequate drainage for pump pits; a third on economy in sewage pumping at the Galesburg, Ill., plant where a Yeomans pump is powered by a sewage gas engine; and a fourth on Shones ejectors and their use for sewage pumping at Navy bases. Bulletin 4003 describing the Shone system of sewage pumping, may be obtained from Yeomans Bros. Co., Chicago, Ill.

Zeolite Water Softeners, as manufactured by the Lakeside Engineering Corp. of Chicago, are presented in Bulletin No. 36 of that company. The bulletin was prepared for assistance to engineers who may be interested in the design of Zeolite water softener installations. More than 20 years of experience are reflected in

EDDY
FIRE HYDRANTS
AND VALVES
WATER WORKS EQUIPMENT



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For
Water Works
and
Sewage Disposal
Plants

EDDY FIRE
HYDRANTS
For Fire
Protection
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Write for Complete Catalog

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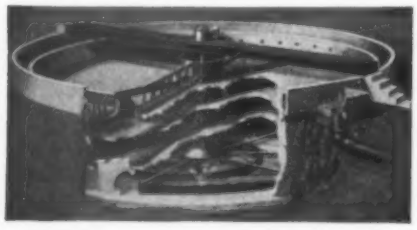
VALVE COMPANY
WATERFORD, N. Y.

NATIONAL SLUICE GATES

Distinguished by precision workmanship

If you haven't seen a National Sluice Gate you can't appreciate its unusual combination of giant strength and velvet-smooth operation. Finest materials, ample sizing, painstaking workmanship and assembly assure you of a gate which really shoulders the load. Send for descriptive literature.

NATIONAL MACHINE WORKS
1559 N. Sheffield Ave., Chicago 22, Ill.



P.F.T. Clarifiers for Rapid Precipitation of Sewage Solids

The P.F.T. Tray Clarifier embodies a design which affects the continuous rapid separation of the solids and liquid in sewage; and the immediate removal of the clarified effluent. A series of shallow settling areas over which the sewage is spread assures speedy precipitation. Its high rate of flow provides maximum capacity in minimum space; reducing the construction and operating costs of clarification equipment.

Write for Bulletin No. 210 containing complete information, including operating results.

P.F.T. Pacific Flush-Tank Company
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C.

the design of the equipment shown in this bulletin.

Containing photographs and line diagrams of installations, the bulletin contains features of Lakeside softeners, specifications for Zeolite softeners, discussion of the economy of softening water, and descriptions of domestic-type water softeners. Also included is the design of the baffle gravel bed arrangements applicable to either pressure or gravity water filters or Zeolite water softeners.

Bulletin 36 contains technical information on the Zeolite process, types of Zeolite, capacity of Greens and both standard and high capacity, and high and low capacity synthetic Zeolites, carbonaceous Zeolites, quantity of Zeolite required, size of softener required, exchange capacity of softener for plant rates of flow, water softener data, brine tank data, downflow versus upflow, as well as many other technical features of Zeolite water softening.

Bulletin No. 36 on Zeolite water softeners may be obtained from the Lakeside Engineering Corp., 22 West Adams St., Chicago, Ill.

ACF Plug Valves, manufactured by the American Car and Foundry Co., are described in a bulletin of that company. These full pipe-area lubricated plug valves may be had in semi-steel, bronze, and other metals for handling acids, caustics, chemicals, oil, water, air, gas, vacuum, and other fluids. The bulletin shows that these lubricated plug valves give full pipe-area port opening, and describes tapered vs. cylindrical plugs, as well as showing various types and styles of valves and data concerning each.

This bulletin and additional information contained in Catalog 3-C, may be obtained from American Car and Foundry Co., Valve Dept., 30 Church St., New York, N. Y.

"Mechanical Feed Water Regulation for Boilers" by Professor E. P. Culver is now available in its sixth edition. This authoritative text covers the principles of boiler feed water control, and describes mechanical equipment available to meet various operating conditions. Differential pressure control and feed pump control are also discussed. Contains numerous illustrations, diagrams, and chart reproductions. First published in 1938, the textbook has been popular with power plant engineers, operators, and engineering students. The current edition has been revised to keep its contents up to date. This 28-page paperbound book is furnished free on request to the Northern Equipment Co., 1945 Grove Drive, Erie, Pa.

INQUIRIES INVITED on all Problems of WATER TREATMENT

Whether your problem of water rectification is large or small, we have a form of equipment to serve your needs. We manufacture and install equipment for Gravity Filtration and Softening Plants; Pressure Filters and Zeolite Softeners; Swimming Pool Recirculating Appliances; and Water Treatment Units of all types.

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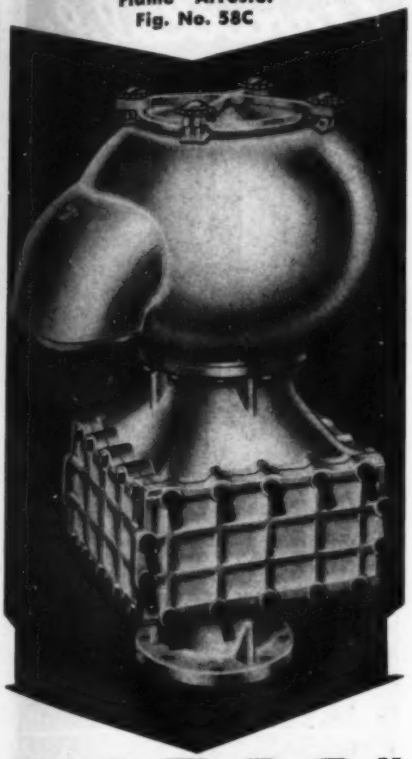

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Falk Motoreducer is Bulletin 3100 of the Falk Corporation of Milwaukee. This 62-page catalog shows motor reducer drives for all possible uses. Both horizontal and vertical drives for all requirements are available in h.p. ratings of 1 to 75. How to select the proper motor, from selection pages, and the dimensions of the equipment are given in specially prepared pages.

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Bull. 3100 may be obtained from the Falk Corporation, Milwaukee, Wis.

Sewer and Drain Handbook is a pocket-size pamphlet of the Roto-Rooter Corp. of Des Moines, Ia., whose purpose it is to place in one's hands specific information on sewer and drain stoppages. The common causes of sewer stoppages are roots, grease, scale, corrosion, and other debris. The booklet describes suggestions and remedies for these stoppage causes. One certain remedy is the Roto-Rooter, the action of which is also diagrammed. This machine has rapidly revolving steel cutting blades which flex and easily go through a clean-out opening in the soil pipe and then expand to the size of the pipe to be cleaned, giving "Razor-Kleening" without damage to the sewer tile, while negotiating bends and turns easily. Grease, scale, and corrosion may also be removed by this machine. For this pamphlet or further information write the Roto-Rooter Corporation, 2300 University Ave., Des Moines, Iowa.

Amercoat Plastic Coatings as manufactured by the American Concrete & Steel Pipe Co. of Los Angeles are presented in an informative brochure which describes these corrosion proof, non-contaminating plastic coatings, what they are, and what inherent properties they have. The book also shows the results of Amercoat tests and applications of the coatings in more than a dozen industrial processes, as well as a list of the Amercoat Solutions, several of which are of interest in the water

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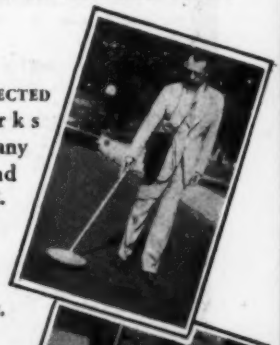

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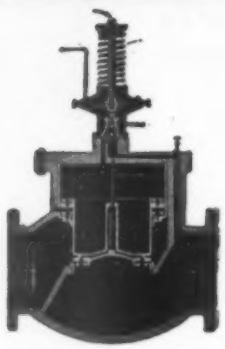

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Elgin Zeolite Water Softeners and other water conditioning equipment are shown in Bull. 603 of the Elgin Softener Corp., Elgin, Ill. This new 16-page bulletin covers all types and sizes for any application. Included is a detailed description of the newest type Elgin "Double Check" Zeolite Softener which gives up to 44 per cent more capacity, prevents zeolite loss, cuts back-wash and rinse water requirements and reduces salt consumption. Bull. 603 also explains how to increase capacity and efficiency of existing zeolite softeners. Other subjects covered in the bulletin include iron removal, filtration, aeration, and boiler water conditioning. Bull. 603 may be obtained by writing the Elgin Softener Corp., Elgin, Ill.

Bulletin No. 4320 of Schramm, Inc., West Chester, Pa., shows Model 20 of the Schramm Air Compressor in a single sheet release. This model may be obtained in skid mounting, shop truck with handles, or in a two-wheel trailer. Also obtainable is a combination of the No. 20 compressor and a small sand blast for descaling. Specifications, dimensions, and prices are also given.

Gage Glass Troubles is the title of a one-page reprinted article from Power Plant Engineering by T. J. Thompson, Manager Industrial Division, Corning Glass Works. The article contains a thorough discussion of various factors influencing the life of gage glass, including steam temperature, steam pressure, rate of condensation, drift or slope of steam piping to gage, gage design, boiler water composition, boiler water pH, or alkalinity, movement of water in gage, thermal shock, and glass composition.

For any who have gage glass problems, this reprint may be obtained from Corning Glass Works, Corning, N. Y.

New Items in Pyrex Laboratory Glassware are presented in Supplement No. 4 to Catalog LP21 of the Corning Glass Works. Graduates with the hexagonal base to prevent rolling when laid on the side, and cylinders graduated with the Life Time Red to make for easier reading are included in this catalog. Also

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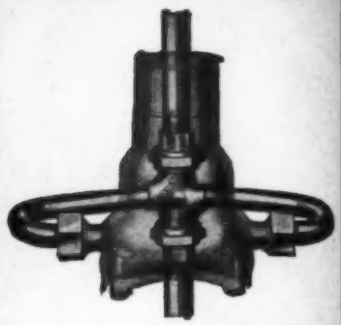

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included are Petri culture dishes and Buchner funnels which are of interest to the sanitary engineer and chemist. Supplement No. 4 or Catalog LP21 may be obtained from the Corning Glass Works, Corning, N. Y.

"A Postwar Proposal" is made by Voigt & Son Co. of Buffalo, N. Y., fabricators of steel and iron equipment. In a brochure, which points out that postwar planning seems to be moving into high, Voigt issues an invitation to aggressive individuals or organizations to open negotiations on postwar propositions with an achievement-minded group. The proposition to be interesting must, however, have enough potential earning power to produce $100,000 in yearly earnings. It may consist of taking a product idea from scratch and include research, design, manufacturing and merchandising, or just design and manufacturing, or manufacturing alone.

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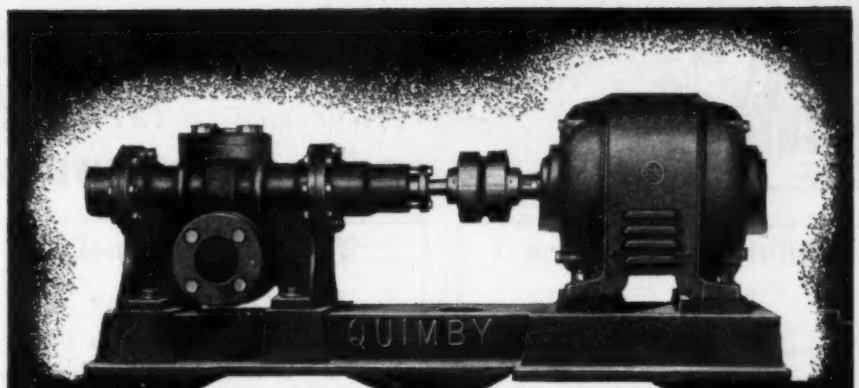
see Voigt and Son, Co., Buffalo, N. Y." And, the reader is assured that all information will be treated in the strictest confidence and acted upon promptly.

Priorities for Chlorinator Maintenance is Wallace and Tiernan's Priority Letter No. W-8 in a series which this company has prepared to help the water and sewage works operator better understand the various orders from WPB. This letter W-8 gives a summary of the new U-1 order with particular reference as to how it applies to chlorinating equipment and maintenance thereof.

In addition to giving the new definitions concerning "minor plant addition" and "inventory"; explaining the application of AA-1 and AA-3 priorities; explaining the ruling about plants with less than $10,000 inventory; listing certain restrictions; and explaining that sewage treatment plants and systems do not come under Order U-1 of the Water Division, OWU, the letter contains an enclosure giving Water Producers Operating Schedules A, B, C, and D. Any person who has not received one of these letters W-8 may benefit by requesting one from Wallace and Tiernan Co., Inc., Belleville 9, New Jersey.

Flow Meter Engineering, Reprint No. 29, of Cochrane Corp., is the Why, When, and Where of Flow Meters and Instruments as they are used in modern plants. This reprint by Wm. C. Bennett contains a considerable amount of basic engineering data and two pages of drawings are devoted to details of proper installation. Reprint No. 29, which also contains helpful hints for keeping instruments out of repair shops, may be obtained from the Cochrane Corp., 17th and Allegheny Ave., Philadelphia 32, Pa.

A new catalog of technical books has just been issued by The Chemical Publishing Co., Inc., 26 Court Street, Brooklyn 2, N. Y. This catalog includes the latest books on chemistry, technology, physics, general science, mathematics, engineering, radio, aviation, foods, formularies, cosmetics, gardening, medicine, metals, technical dictionaries, etc. This catalog, conforming with the requests of technical and scientific workers and librarians, gives the date of publication of each book as well as a concise description and full table of contents. A copy of this catalog will be sent free to anyone adddressing a request to Chem. Pub. Co., 26 Court St., Brooklyn 2, N. Y.



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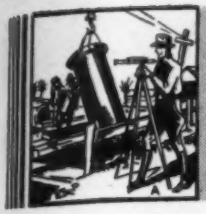

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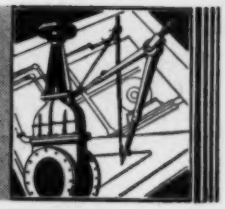

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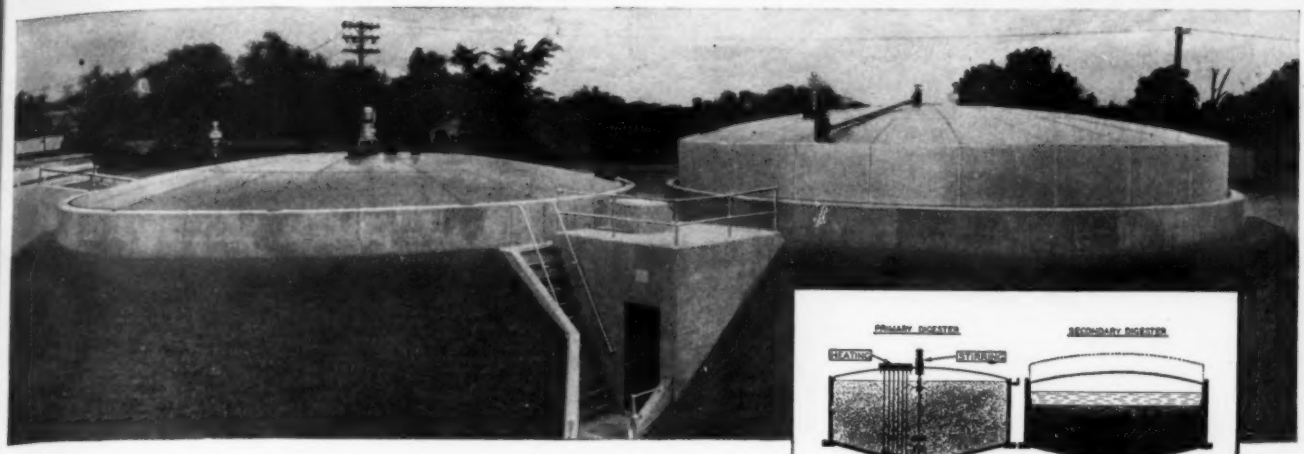
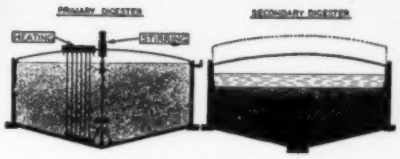


● Hagerstown, Md. — A typical Dorr Multdigestion System. Stirred and heated primary tank at left; unheated, plain secondary at right.



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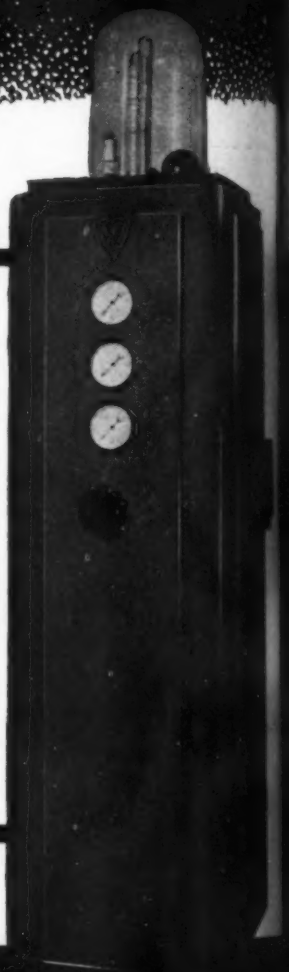

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